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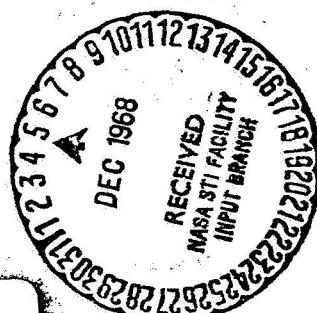
June 1968

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Frequency and Duration of  
Thunderstorms at Cape Kennedy  
Part 1

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In connection with ESSA-Weather Bureau support to space and missile range projects, a number of studies are made to answer specific meteorological and related questions, and to develop specialized techniques pertinent to this support. This series of ESSA Technical Memoranda provides a medium in which reports based on such studies can be published as part of the informal scientific literature. Material in this series may be published formally elsewhere at a later date.

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No. 1 Probability of Tropical Cyclone Induced Winds at Cape Kennedy. J. R. Hope and C. J. Neumann. June 1968.

U. S. DEPARTMENT OF COMMERCE  
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION  
WEATHER BUREAU

Weather Bureau Technical Memorandum SOS-2

FREQUENCY AND DURATION OF THUNDERSTORMS AT CAPE KENNEDY  
PART 1

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SPACE OPERATIONS SUPPORT DIVISION  
SILVER SPRING, MD.  
June 1968



This report is a revision of an earlier report of the same title issued informally by the Miami Section of the Spaceflight Meteorology Group, October 1966. The purpose of this revision is twofold: 1) to update the period of record with two additional years of data through 1967, and 2) to present additional statistical data on thunderstorm probabilities at the Kennedy Space Center. This revision was made possible through the utilization of the computer facilities available to the Miami ESSA complex through arrangement with the collocated University of Miami Computing Center.

The Weather Bureau's Spaceflight Meteorology Group (SMG), through funds transferred from the NASA Office of Manned Space Flight, provides the primary meteorological support for the NASA manned spaceflight programs. The author is a member of the Miami Section of SMG.

This particular study, Part I, is designed to enable the forecaster or mission planner to estimate the thunderstorm probabilities at the Kennedy Space Center for prognostic periods of beyond five days. Part II is currently in preparation. The main purpose of Part II will be to enable the forecaster to estimate the shorter range operational thunderstorm probabilities at the Space Center based largely on the observed 3000-foot wind speed and direction at Cape Kennedy.

## INTRODUCTION

Portions of Peninsular Florida observe more seasonal thunderstorm activity than any other site over the United States (U. S. Weather Bureau, 1952); moreover, the area is one of the major thunderstorm-gensis areas over the earth (Landsberg, 1958). It generally is agreed that the reason for this condition is related to the presence of rather unique physical-environmental conditions. There is virtually an inexhaustible supply of low-level moisture with attendant conditional instability. Furthermore, the land mass is large enough to allow vigorous afternoon convection with further lifting action supplied by the sea-breeze convergence (Byers and Rodebush, 1948) and in some cases by transitory synoptic or sub-synoptic scale phenomena.

The nature of the causitive conditions is such that there are marked temporal and spatial variations to the thunderstorm maximum. In general, the greater part of the activity occurs over the interior sections of the peninsula on summer afternoons. Figure 1 shows the relationship of Cape Kennedy to the rest of the area insofar as the spatial maximum is concerned during the four-month period June through September and also during the peak two-month period July and August. The isolines on the figure are based on long period records for the stations concerned (U. S. Weather Bureau, 1952 and U. S. Weather Bureau, 1966).

Although Figure 1 depicts a relative thunderstorm maximum over interior sections, synoptic forecasting experience has shown that the longitudinal position of the maximum during any given afternoon is a function of the existing low tropospheric wind distribution. In general, with a substantial easterly wind component, the maximum occurs farther westward while with the opposite wind component, the thunderstorm maximum occurs farther eastward. Based on radar data alone, Frank, Moore, and Fisher (1967) have documented this condition. The authors have shown further that light and variable winds tend to produce a double thunderstorm maximum, that is, one just inland from both coasts. A westerly wind regime or a light and variable wind regime normally will result in thunderstorms being advected into or building near Cape Kennedy. Only on rare occasions, apparently as a consequence of large-scale divergence as evidenced by mid-tropospheric dryness, do summertime thunderstorms fail to materialize over the Florida peninsula. Indeed, then, the summertime forecast problem at Cape Kennedy is primarily one of forecasting the velocity of the low-tropospheric wind field.

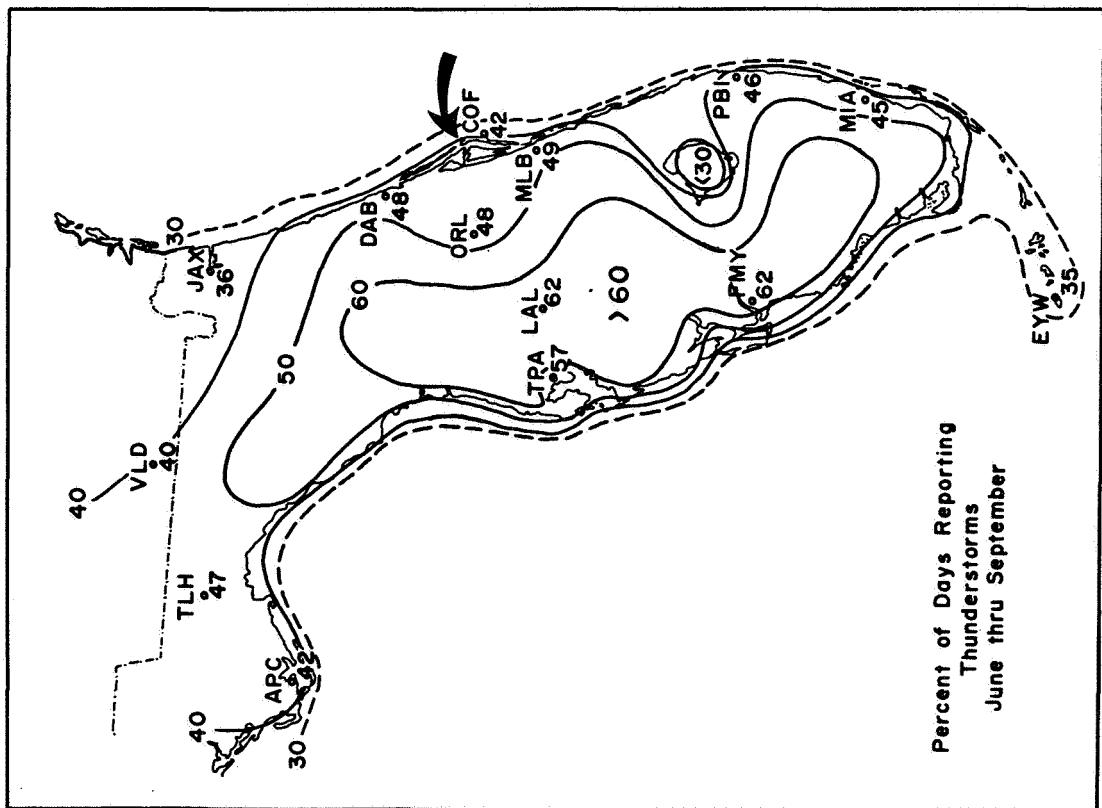
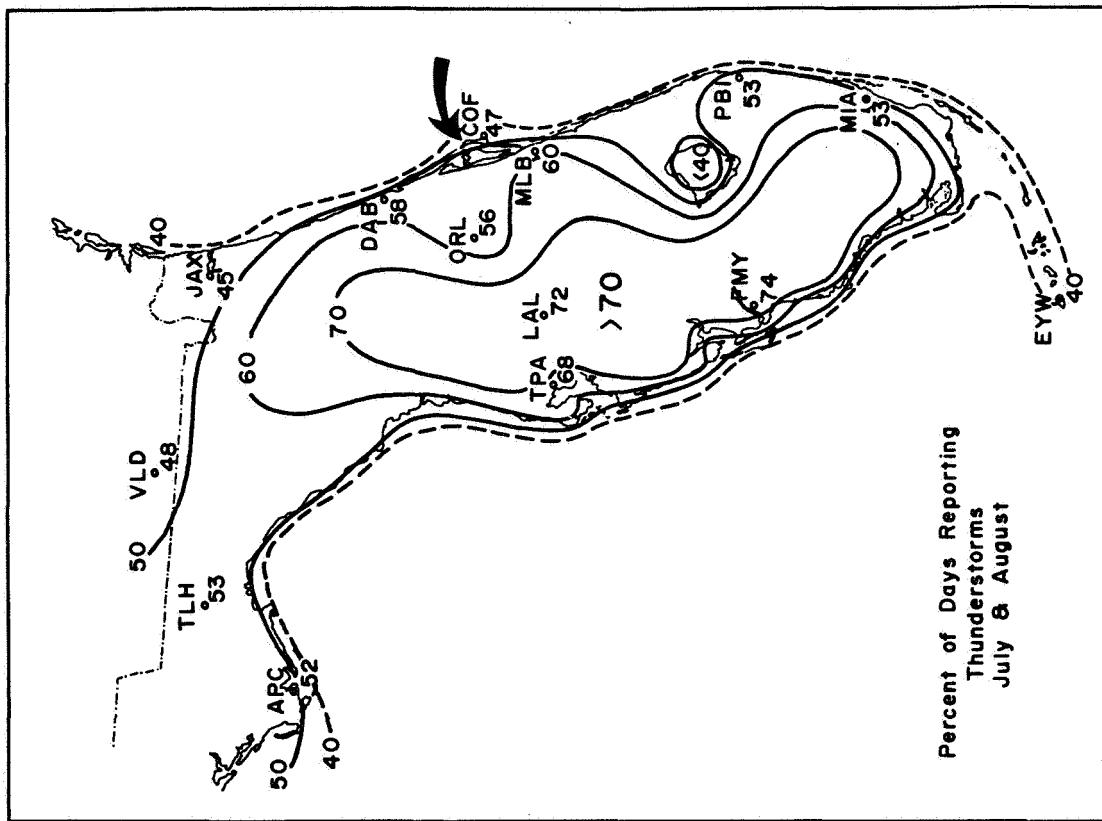


Figure 1: Percent of days reporting thunderstorms. Arrow shows location of Cape Kennedy.

### PURPOSE

In the foregoing brief introduction, some of the basic factors relating to the Florida thunderstorm maximum were discussed. However, the main purpose is to present a definitive reference on certain climatological parameters dealing with the duration and frequency of thunderstorms at Cape Kennedy itself. Standard available climatological summaries are deficient in several respects. In the first place, most operational problems require statistical information relating to the normal frequency of thunderstorms over an extended period, say three or six hours rather than at a spot time as given in standardized summaries. Secondly, use of the summaries requires the normally invalid assumption that conditions at mid-month are representative of the month as a whole, giving an unrealistic stepwise frequency distribution. Any attempt at simple interpolation between the mid-periods of adjacent months may lead to errors because of non-linearity of the data distribution. Another shortcoming of standardized summaries of non-continuous parameters such as "observations with thunderstorms" is that they do not sample all the data. About 11% of the thunderstorm occurrences at Cape Kennedy begin and end between hourly observations and thus are not recorded on the hourly observations upon which the summaries are based.

### DATA AVAILABLE FOR ANALYSIS

Copies of the original WBAN form 10A and 10B for Cape Kennedy are available at SMG, Miami, for the eleven year period 1957 through 1967. In addition, microfilm records were obtained for the preceding years back to May 1950. During this earlier period, however, records were not always maintained for the complete 24-hour period and only 1951 and 1952 were complete in this respect. Accordingly, then, a total of thirteen years (1951, 1952, and 1957 through 1967) were utilized.

The actual location of the observation site is about a mile inland from the easternmost point of Cape Kennedy. During the earlier years, the site was a mile or so farther south and somewhat closer to the ocean. This slight shift in the observation site is believed to be insignificant insofar as overall thunderstorm frequency statistics are concerned.

### PROCEDURE

Initially, master data sheets were compiled from the WBAN 10A forms listing the beginning and ending time of all observations of thunder (T, TR, or TRW) at Cape Kennedy during the thirteen year period of record. In all, 1223 separate thunderstorm<sup>1</sup> occurrences were recorded

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<sup>1</sup>According to standard observational procedure, a thunderstorm is considered ended when at least 15 minutes passes without thunder. An individual thunderstorm occurrence may consist of thunder from one or more individual cells.

on 912<sup>2</sup> calendar days with a total duration of 2071.8 hours. These data were transferred to computer data cards and all data computations were done on the University of Miami IBM 7040 computer. On a monthly and annual basis, these data were initially summarized in three ways: 1) the number of individual thunderstorm occurrences, 2) the number of days with at least one thunderstorm and, 3) the total time with thunderstorms. The annual thunderstorm cycle at Cape Kennedy appears somewhat different depending whether one selects statistic 1, 2, or 3 for further analysis. This can be seen by a study of Tables 1, 2, and 3.

Table 1 presents monthly and annual data based on the mean number of individual thunderstorm occurrences. Note that a distinct maximum occurs in mid-July with a secondary maximum in late March. Table 2 presents monthly and annual data on the number of days with at least one thunderstorm. Note that the means of Table 2 are less than those of Figure 1, due, of course, to the fact that more than one thunderstorm can occur on any given day. It is interesting to note that although more individual thunderstorms are observed in March than April (Table 1), a greater number of "days with thunderstorm" occurs in the latter month. The annual summer-time maximum appears from Table 2 to occur about 1 August. Table 3 presents data on the total time with thunderstorms.<sup>3</sup> In this summary, a well-defined maximum appears to occur around the third week of July. A well-defined secondary maximum occurs in March.

Tables 1, 2, and 3 have presented simple statistics on the monthly frequency of thunderstorms without regard to diurnal variation. The method of presenting further data depends on the specific operational problem for which these data may be used. For most spaceflight applications, information relative to the occurrence or non-occurrence of a thunderstorm during a given time span is a more meaningful statistic than the mean number of individual occurrences or the mean duration of thunderstorms. Furthermore, in forecasting practice, no attempt is made to specify whether a single or multiple thunderstorm occurrence is expected nor is the duration of a thunderstorm specified. Rather, the forecast will specify something like "scattered thunderstorms this afternoon and evening". For this reason, it was decided to investigate the thunderstorm cycle at the Cape from the standpoint of "number of days" with a further diurnal breakdown to encompass any other desired frequency such as "number of afternoons" or "number of evenings", etc., with thunderstorms.

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<sup>2</sup>The total 912 includes 13 days which were considered thunderstorm days only because a thunderstorm which started on the previous day, continued past midnight and no further thunder was recorded on these 13 days. This is standard observational practice.

<sup>3</sup>Fifteen minutes were subtracted from the ending time of all thunderstorms - see footnote 1. Thus, a thunderstorm which started at, say 1600E and ended at 1620E produced audible thunder at the observing site from 1600E to 1605E. Accordingly, in this case, only 5 minutes would be recorded in Table 3.

Table 1. Number of individual thunderstorm occurrences.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1951	0	0	0	4	9	17	19	15	17	6	3	1	91
1952	0	1	3	3	14	12	18	17	16	2	0	1	87
1957	0	0	7	1	15	16	25	26	18	4	1	4	117
1958	2	1	6	3	9	11	11	20	10	1	1	0	75
1959	1	3	3	8	10	15	16	15	16	9	0	0	96
1960	0	2	10	3	8	28	27	15	17	9	0	0	119
1961	1	0	4	3	9	22	15	16	10	2	1	1	84
1962	0	3	6	4	4	27	29	27	14	4	1	0	119
1963	1	3	2	4	11	14	23	20	5	6	2	0	91
1964	0	1	1	6	2	7	9	25	7	1	5	4	68
1965	2	1	8	4	4	18	23	16	5	2	1	0	84
1966	0	1	2	1	19	12	14	18	29	2	0	0	98
1967	0	1	0	0	3	33	32	13	7	2	0	3	94
Total	7	17	52	44	117	232	261	243	171	50	15	14	1223
Mean	0.5	1.3	4.0	3.4	9.0	17.8	20.1	18.7	13.2	3.8	1.2	1.1	94.1

Table 2. Number of "Days with Thunderstorms"

	<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>	<u>ANNUAL</u>
1951	0	0	0	5	6	14	14	12	12	4	2	1	70
1952	0	1	3	3	11	10	11	16	11	2	0	1	69
1957	0	C	4	1	12	12	17	18	11	3	1	3	82
1958	1	1	4	3	6	10	9	14	9	1	1	0	59
1959	1	2	2	6	10	10	10	12	12	7	0	0	72
1960	0	2	4	4	7	17	21	11	12	6	0	0	84
1961	1	0	4	3	7	13	9	15	9	2	1	1	65
1962	0	3	5	4	4	17	19	23	10	3	1	0	89
1963	1	2	2	2	8	12	15	15	5	3	1	0	66
1964	0	1	1	5	2	7	8	17	6	1	3	2	53
1965	1	1	5	3	3	13	21	13	4	2	1	0	67
1966	0	1	1	1	14	9	12	12	17	1	0	0	68
1967	0	1	0	0	2	22	23	10	7	1	0	2	68
Total	5	15	35	40	92	166	189	184	125	36	11	10	912
Mean	0.4	1.2	2.7	3.1	7.1	12.8	14.5	14.5	9.6	2.8	0.9	0.8	70.2
% of days	1.2	4.1	8.7	10.3	22.8	42.6	46.9	46.7	32.1	8.9	2.8	2.5	19.2

Table 3. Total time with thunderstorms (hours).

## FURTHER STATISTICAL PROCEDURES

In order to establish the trend of the annual thunderstorm cycle, a 15-day moving average of "days with thunderstorm" was computed for each of the 365 days according to formula (1):

$$F_n = \frac{1}{N} \sum_{k=n-7}^{n+7} T_k \quad (1)$$

where  $F_n$  is the moving average on day number  $n$ ,  $T_k$  is the frequency of one or more thunderstorms on day  $k$  and  $N$  is the total number of days over the period of record. For example, suppose it is desired to determine the average frequency of at least one thunderstorm on July 19 (day number 200). The following data are required by formula (1):

<u>Day</u>	<u>Day Number</u>	<u>Date</u>	<u>Number of occurrences of at least one TSTM</u>
$T(n-7)$	193	July 12	5
$T(n-6)$	194	July 13	6
$T(n-5)$	195	July 14	4
$T(n-4)$	196	July 15	5
$T(n-3)$	197	July 16	4
$T(n-2)$	198	July 17	7
$T(n-1)$	199	July 18	7
$T(n+0)$	200	July 19	6
$T(n+1)$	201	July 20	4
$T(n+2)$	202	July 21	6
$T(n+3)$	203	July 22	6
$T(n+4)$	204	July 23	4
$T(n+5)$	205	July 24	8
$T(n+6)$	206	July 25	7
$T(n+7)$	207	July 26	5
		Total	84

According to formula (1),  $F(200) = 84/13 \times 15 = 0.431 = 43.1\%$ .

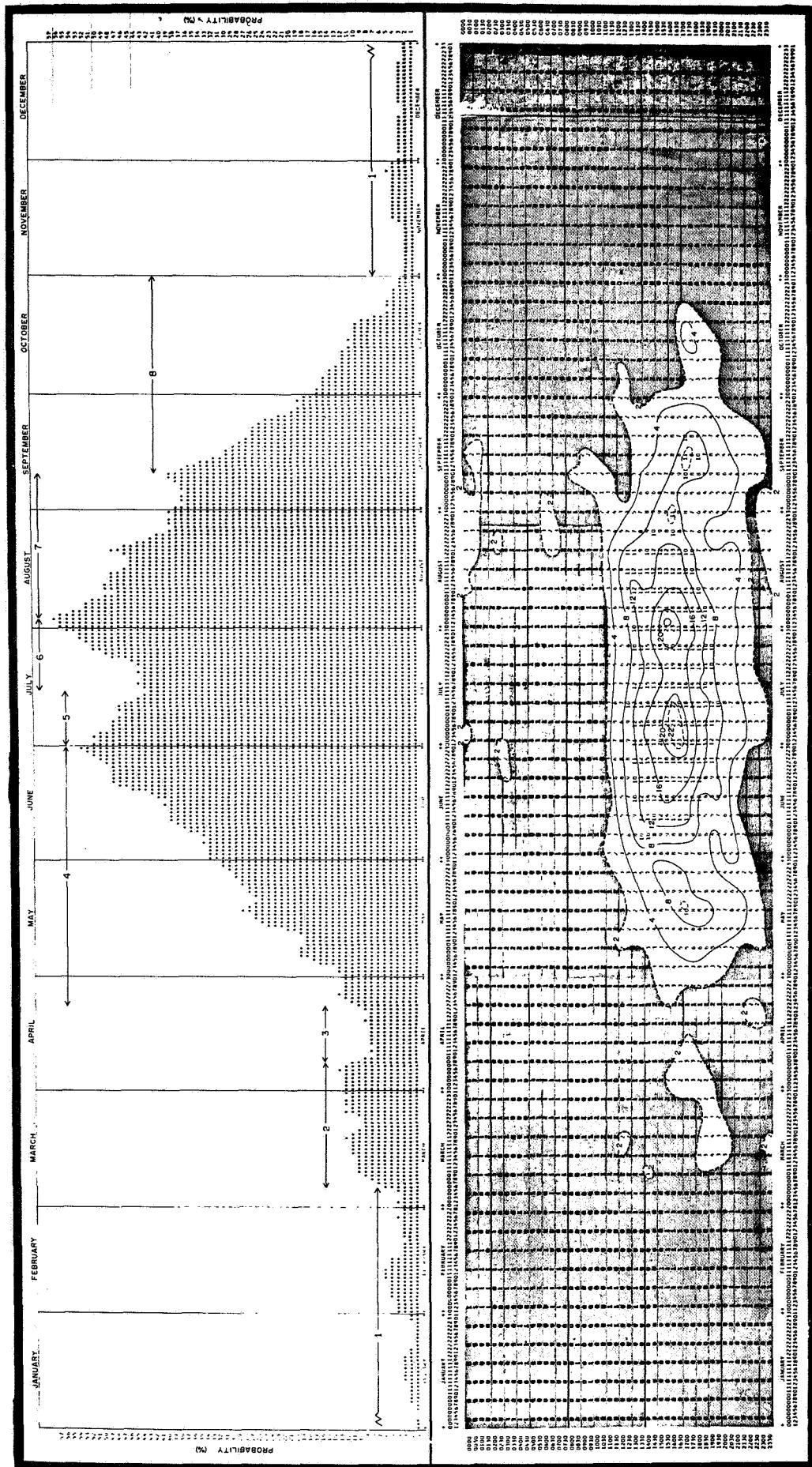
The selection of a 15-day period as the base of the moving average was determined more or less by trial and error. It was found that a 5-day moving average introduced an apparent second harmonic to the annual cycle with a quasi-periodicity of 9 to 12 days. Brooks and Carruthers (1953) have shown that such a cycle can be introduced into moving averages even based on random data. As further pointed out by these authors, such a cycle, even if real, seldom has any forecast value and is apt to be quite fugitive in nature.

A 30-day moving average was also tried but proved to be of excessive duration in that there was too much data smoothing. A 15-day moving average did not introduce a second harmonic and was still short enough to clearly show variations in the annual cycle that were explainable by known atmospheric processes. Accordingly, a 15-day period was selected. It is possible that a slightly shorter or longer period may have improved the final product somewhat but the end result probably would not justify the required expenditure of man hours and computing time.

#### THE ANNUAL THUNDERSTORM CYCLE

Figure 2a is a computer plot of the 15-day moving average of the number of "days with thunderstorm" compiled according to formula (1). Since there is a relatively long period of record effectively increased by the moving average technique, the ordinate of Figure 2a has been labeled in probability rather than in frequency. However, it should be borne in mind that this is an estimate of the true probability. By ignoring the slight day-to-day variations, the general trend of the annual thunderstorm cycle plainly is discernable and, in general, can be subdivided into eight periods:

- Period 1 - (November through early March). Thunderstorms are observed only about once per month and are confined, for the most part, to instability or convergence associated with synoptic-scale disturbances.
- Period 2 - (Early March through early April). There is a marked increase in thunderstorm activity associated primarily with pre-frontal squall lines.
- Period 3 - (Mid April). Slight decline in thunderstorm acitivity due to cessation of frontal activity and still insufficient diurnal heating.
- Period 4 - (Late April through June). Almost linear increase in thunderstorm activity associated with increasing solar heating and attendant instability. The winds aloft remain predominately of a westerly component.
- Period 5 - (First half of July). There is a slight decline in thunderstorm activity. See period 6 for explanation.
- Period 6 - (Latter half of July through early August). There is a secondary increase in thunderstorm activity. The reason for the mid-July slump in thunderstorm activity is probably related to the fact that the mid-tropospheric ridge line is frequently directly over central Florida in July. This results in warmer mid-tropospheric temperatures with attendant stability. By late July or early August, the mid-tropospheric ridge line retreats southward but the low-level ridge line continues to drift northward. This latter condition is a mechanism for greater instability.
- Period 7 - (Early August through the first third of September). Gradual decline in afternoon thunderstorm activity with decreasing



TOP--Figure 2a: Probability (%) of at least one thunderstorm at or in immediate vicinity of Cape Kennedy on any given day (EST).

BOTTOM--Figure 2b: Probability (%) of a thunderstorm being in progress at or in immediate vicinity of Cape Kennedy at any given time on any given day (EST).

R

A

solar heating. The rate of decline is relatively slow during this period due to the fact that nocturnal and early morning thunderstorm occurrence reaches a maximum at this time.

Period 8 - (Latter two-thirds of September through October). There is a rapid decline in thunderstorm activity. The primary reason for this rapid decline is, of course, associated with the decrease in solar radiation. Other contributing factors are the rapid decline of nocturnal activity and the occasional presence of a recurring tropical cyclone off the coast of Florida. This latter condition results in large scale divergence over Florida and oftentimes the intrusion of cooler and drier air.

#### DIURNAL VARIATION OF THUNDERSTORMS

While the annual thunderstorm cycle is described adequately by Figure 2a, little has been said up to this time concerning the diurnal variation of thunderstorms. In order to define the diurnal variation, overlapping frequency distributions were compiled for 15-day periods centered every five days starting on January third. The January third summary includes data for the 15-day period December 27 through January 10; the January eighth summary contains data for the 15-day period January 1 through January 15, etc. By ignoring February 29 (which date occurred three times in the period of record under consideration) this moving average technique conveniently contains exactly seventy-three 15-day overlapping periods. The seventy-third period itself is centered on December 29 and includes data from December 22 through January 5.

The diurnal frequency distributions were computed over nine different time periods ranging from instantaneous occurrences to occurrences over eight-hour periods. Figures 2b, 3, 4, 5, and 6 are computer print-outs for the various time periods. An isoline analysis was performed directly onto the print-out for values of every 4%. Where the gradient was slight, this was increased to every 2%. A shading was used on the Figures in the areas where the frequency was equal to or less than 2%.

Certain controls were used in making the analysis. In the first place, care was taken to insure that each isoline on a particular Figure encompassed a greater area than on the preceding Figure representing the next lower time interval. Also, the analysis was performed with consideration given to tenths of a percent rather than to the whole percent as printed out on the Figures. This was completely insignificant when dealing with the larger percentages but was quite important in the case of the small percentages. It is for the above two reasons that the analysis of the shading may, in some cases, seem to violate the printed data. A third control was that the centers of maximum and minimum

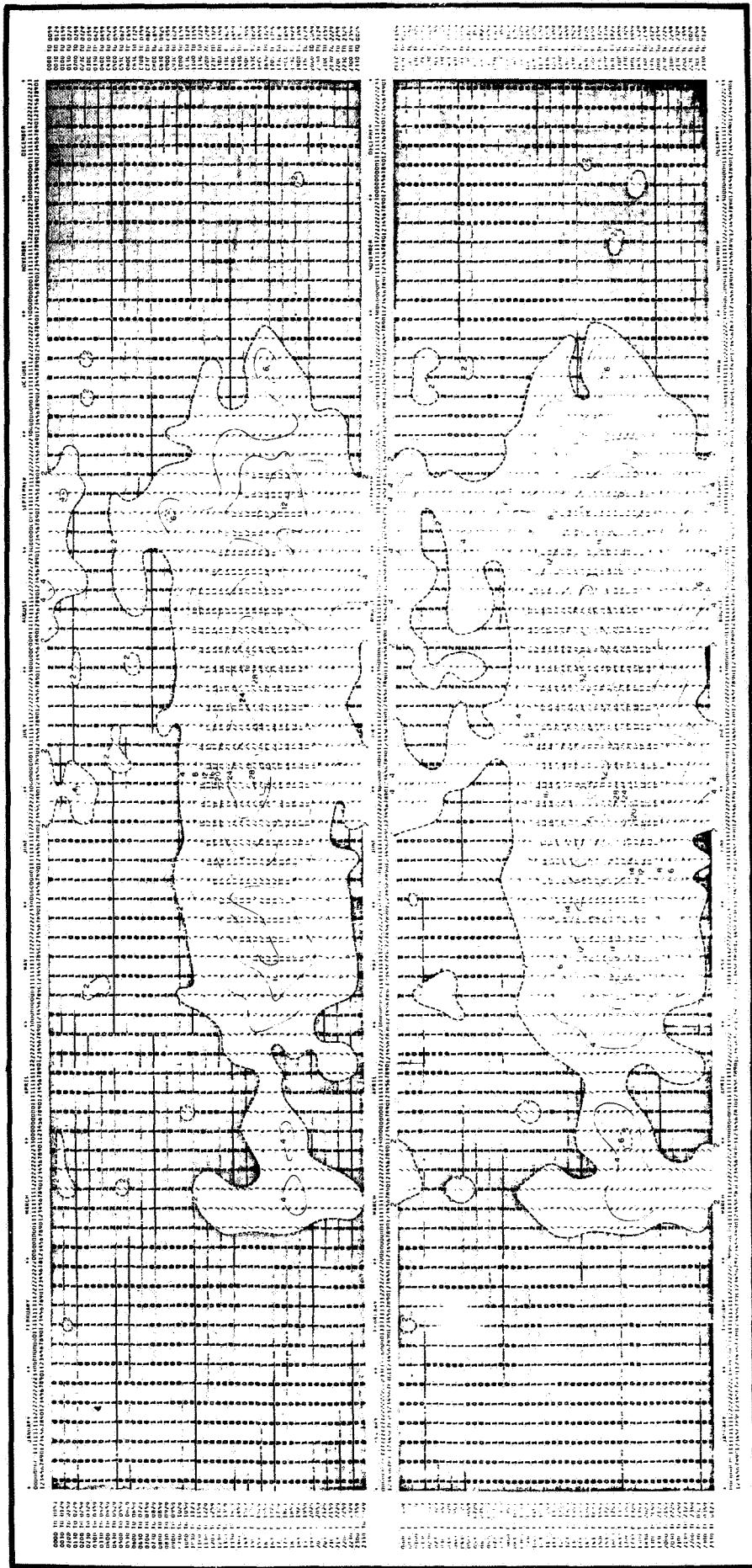


Figure 3: Probability (%) of at least one thunderstorm at or in immediate vicinity of Cape Kennedy on any given day over a time span of (TOP), 1-hour and (BOTTOM), 2-hours. (EST) B

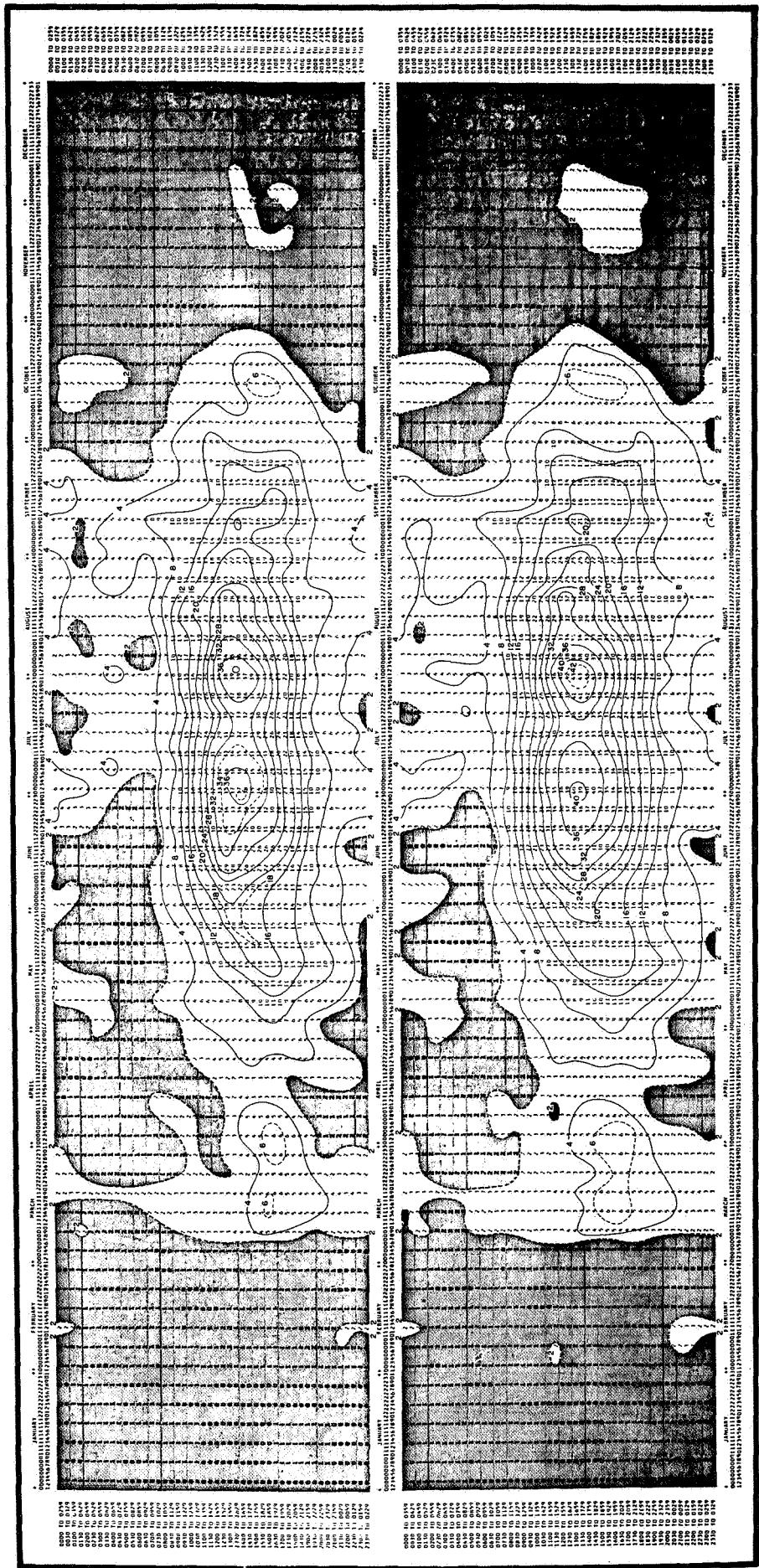


Figure 4: Probability (%) of at least one thunderstorm at or in immediate vicinity of Cape Kennedy on any given day over at time span of (TOP), 3-hours and (BOTTOM), 4-hours.

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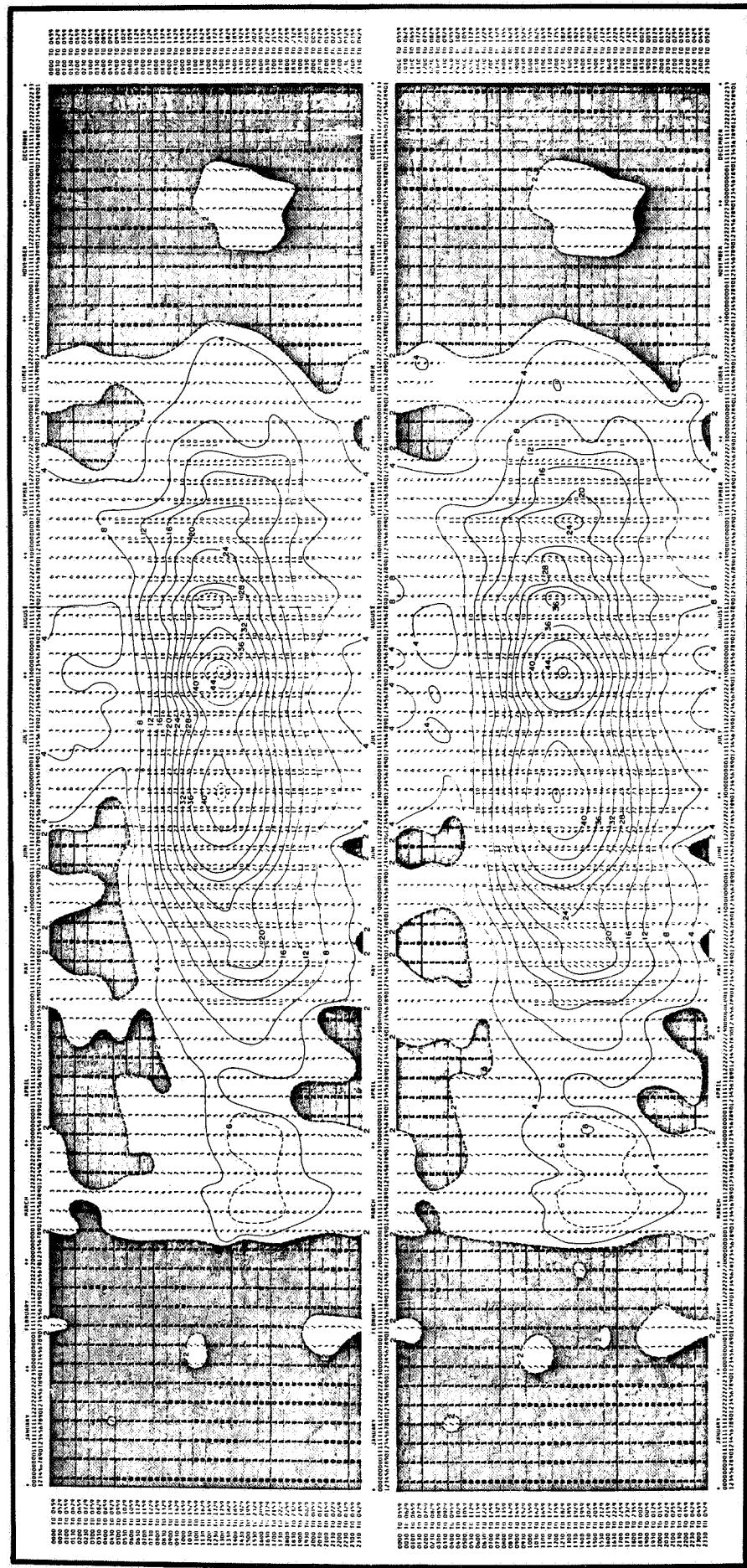


Figure 5: Probability (%) of at least one thunderstorm over a given day for different time spans (TOP), 5-hours and (BOTTOM), 6-hours. (EST)

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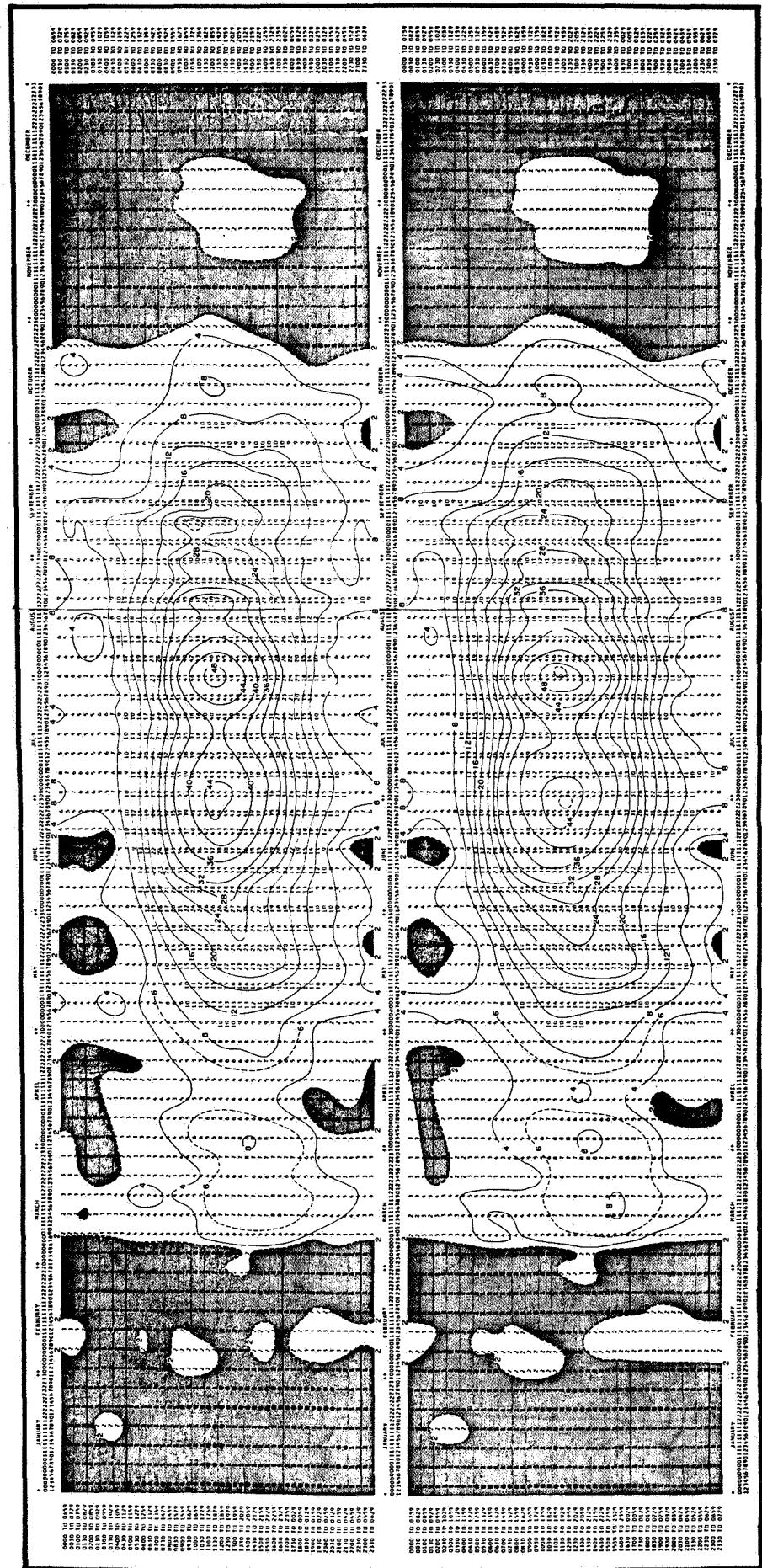


Figure 6: Probability (%) of at least one thunderstorm at or in immediate vicinity of Cape Kennedy on any given day over a time span of (TOP), 7-hours and (BOTTOM), 8-hours. (EST)

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activity on Figures 2b through 6 were positioned with cognizance of the positions of these centers as precisely defined on Figure 2a. Finally, some slight smoothing of the data was accomplished where it seemed appropriate. Actually, very little smoothing was required and the data, for the most part, was analyzed exactly as indicated by the computer print-out. The isolines can be considered to be good estimate of the true probability because of the relatively large amount of data included, because of the moving-average technique, and because of the controls used in making the analysis.

Figures 2 through 6 point out some rather significant features of the thunderstorm pattern at Cape Kennedy. Some of these are listed below:

- a. There is a rather well-defined double peak to the seasonal thunderstorm cycle. On the average, the first peak occurs on June 30th and the second peak on August 3.
- b. Another small maximum occurs between early March and early April.
- c. Thunderstorms can be expected on over 25% of the days between May 16 and September 22. This period can be considered as the main convective thunderstorm season.
- d. Over the 13-year period of record, no thunderstorms ever occurred between December 28 and January 12.
- e. Most night and early morning thunderstorms occur mid-August through mid-September.

#### ONE OR MORE THUNDERSTORM OCCURRENCES OVER EXTENDED TIME PERIODS

Figures 2a through 6 each presented data pertaining to the probability of thunderstorm occurrence on a particular day or over a time period of up to 8 hours duration. Occasionally it becomes necessary to estimate the thunderstorm probability over a more extended time period. It may be required, for example, to estimate the probability of at least one thunderstorm occurring over a three-day consecutive period. Or, more specifically, it may be necessary to estimate the probability of at least one afternoon thunderstorm during the 7-day period, starting say, July 22.

The method used to estimate these extended probabilities was similar to the method used to determine the 24-hour probabilities specified on Figure 2a as computed by formula (1). The formula can be restated using a slightly different subscript notation:

$$F_{n(j)} = \frac{1}{N} \sum_{k=n-7}^{n+7} T_k(j) \quad (2)$$

where  $F_{n(j)}$  refers to the 15-day moving average over a j-day period starting on day n,  $T_k(j)$  is the frequency of one or more thunderstorms over a set of j-consecutive days starting on day k and N is the total

number of j-day sets. For example, suppose it is desired to determine the average frequency of at least one thunderstorm over the 3-day period starting on July 19 (day number 200). The following data are required by formula (2):

<u>Day</u>	<u>Day Numbers</u>	<u>Dates</u>	<u>Number of occurrences of at least one TSTM</u>
T <sub>n</sub> -7(3)	193,194,195	July 12,13,14	9
T <sub>n</sub> -6(3)	194,195,196	July 13,14,15	8
T <sub>n</sub> -5(3)	195,196,197	July 14,15,16	6
T <sub>n</sub> -4(3)	196,197,198	July 15,16,17	7
T <sub>n</sub> -3(3)	197,198,199	July 16,17,18	9
T <sub>n</sub> -2(3)	198,199,200	July 17,18,19	9
T <sub>n</sub> -1(3)	199,200,201	July 18,19,20	8
T <sub>n</sub> -0(3)	200,201,202	July 19,20,21	10
T <sub>n</sub> -1(3)	201,202,203	July 20,21,22	8
T <sub>n</sub> -2(3)	202,203,204	July 21,22,23	8
T <sub>n</sub> -3(3)	203,204,205	July 22,23,24	9
T <sub>n</sub> -4(3)	204,205,206	July 23,24,25	9
T <sub>n</sub> -5(3)	205,206,207	July 24,25,26	10
T <sub>n</sub> -6(3)	206,207,208	July 25,26,27	10
T <sub>n</sub> -7(3)	207,208,209	July 26,27,28	10
Total			130

According to formula (2),  $F_{200}(3) = 130/195 = 0.667 = 66.7\%$ .

The same technique was used to estimate the probability of at least one thunderstorm on 2,3,4,5,6, and 7 days for any day of the year. Figure 7 is a computer plot of these data. Also included on Figure 7, for comparative purposes are the single day probabilities that appeared on Figure 2a. A tabular listing of the plotted data are given in the Appendix under Table A.

Formula (2) was also used to estimate the probability of at least one afternoon-type thunderstorm on j-consecutive days. To do this, the computer program was modified to filter out all non-afternoon type thunderstorms; an afternoon type thunderstorm being defined as one which occurred between 1000EST and 2200EST. A plot of these data are shown in Figure 8, while a tabular listing thereof is given in the Appendix under Table B. The data included in Figures 7 and 8 are considered to be good estimates of the true probabilities and accordingly, the ordinate is labeled as probability.

#### MULTIPLE THUNDERSTORM OCCURRENCES ON SINGLE DAYS

Standard observational procedure requires that a thunderstorm be considered to have ended when at least 15 minutes passes without thunder. For this reason, more than one "thunderstorm" can occur on a single day.

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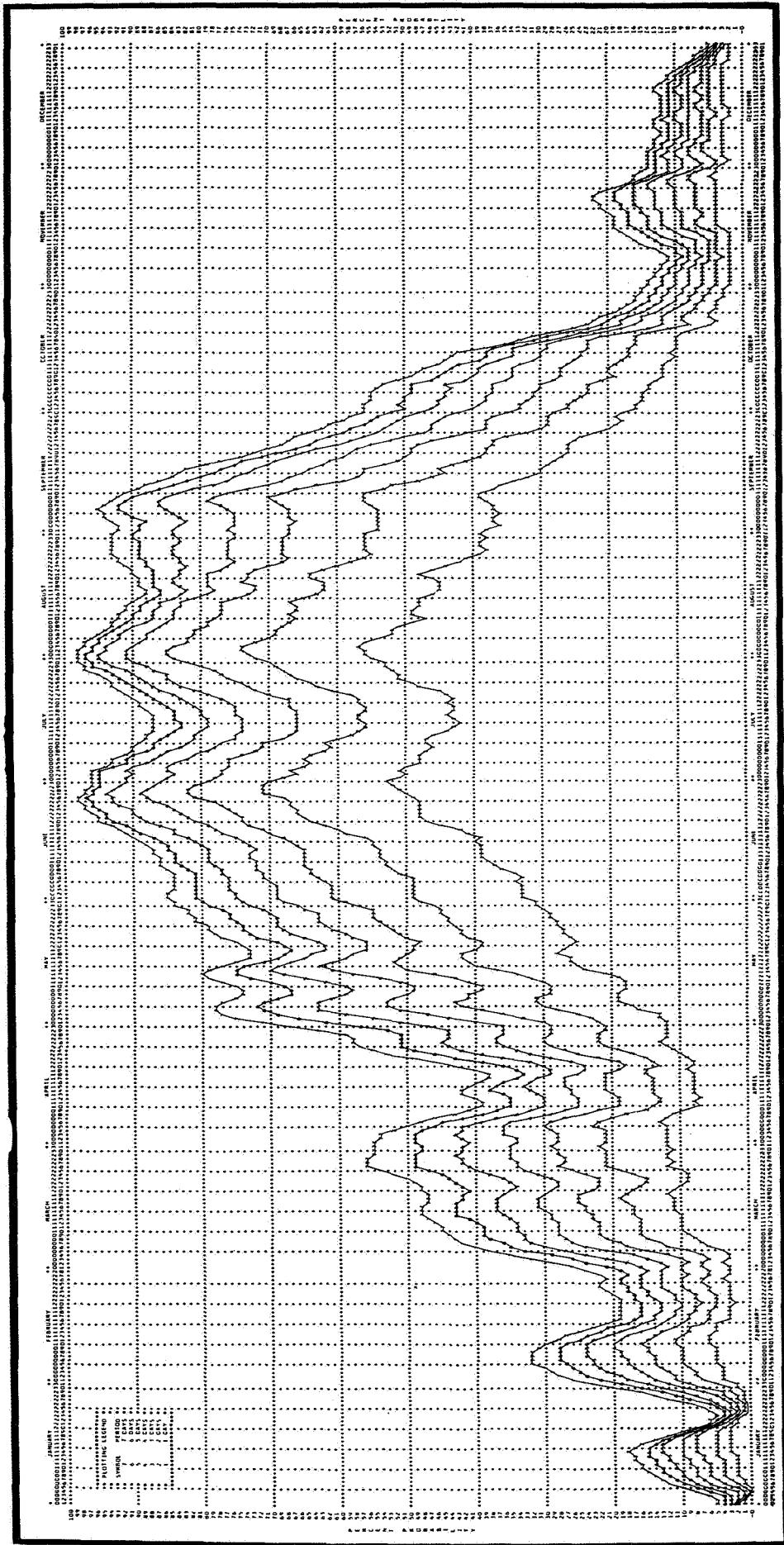
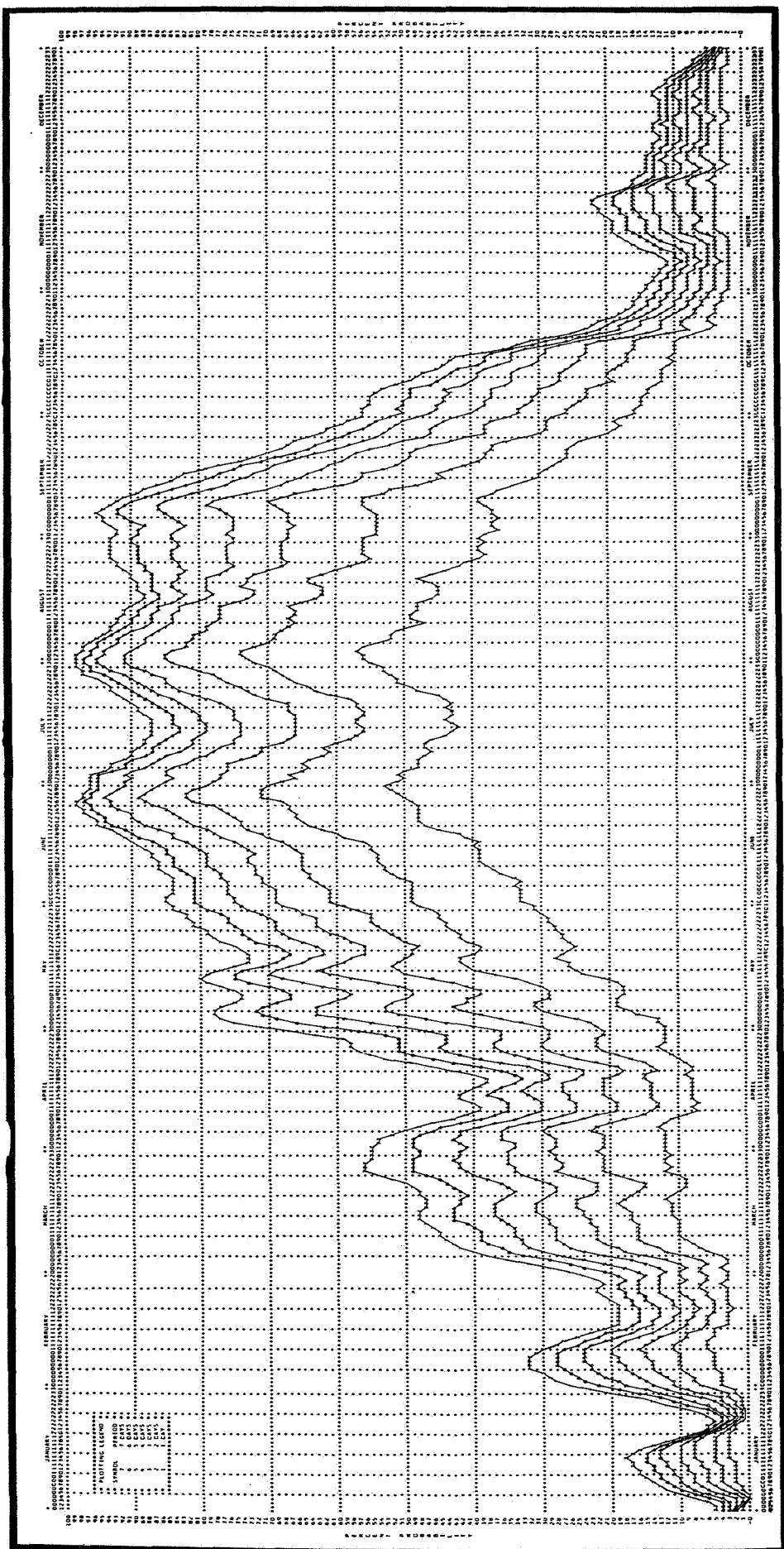


Figure 7: Probability (%) of at least one thundershower at or in immediate vicinity of Cape Kennedy over periods ranging from 1 to 7 consecutive days (EST) starting on day listed along abscissa.

Figure 7: Probability (%) of at least one thunderstorm at or in immediate vicinity of Cape Kennedy over periods ranging from 1 to 7 consecutive days (EST) starting on day listed along abscissa.



Of the 899 days upon which 1223 "thunderstorms" began, 638 (71.0%) of the days had single occurrences; 204 (22.7%) of the days had two occurrences; 51 (5.7%) of the days had three occurrences and the remainder, 6 (0.6%) had four occurrences. There were no cases of 5 or more occurrences in a single 0000-2400EST day. For a particular month, July, the breakdown is shown in Table 4. Included also in Table 4 are the number of days without any occurrence.

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Table 4. Actual and Theoretical Number of Thunderstorm Occurrences on Single Days for the Month of July.

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	number of occurrences (x)					
	0	1	2	3	4	5
Actual	214	130	47	11	1	0
Theoretical	210.4	136.6	44.7	9.7	1.2	0.4

Total number of occurrences = 261

Total number of days = 403

Mean of x = 261/403 = 0.65

---

Shown also in the table are the theoretical number of occurrences computed according to the Poisson distribution function:

$$F(x) = e^{-m} m^x / x! \quad (3)$$

where  $F(x)$  is the probability distribution function,  $x$  is the number of occurrences,  $e$  is the base of natural logarithms and  $m$  is the expected (mean) value of  $x$ . The excellent agreement between the fitted and actual values indicates that the distribution is closely approximated by the Poisson distribution function.

#### DAYS WITHOUT THUNDERSTORMS

Figures 2 through 8 present data on the probability ( $p$ ) of at least one thunderstorm over various time intervals. The probability of non-occurrence ( $q$ ) is given by:

$$q = (100-p) \quad (4)$$

where both  $q$  and  $p$  are expressed in percent. For example, from Figure 7, the probability of at least one thunderstorm over the seven-day period July 19 through 25 is read as 89%. From formula (4) the probability of non-occurrence of thunderstorms between the period July 19 through July 25 is computed to be 11%.

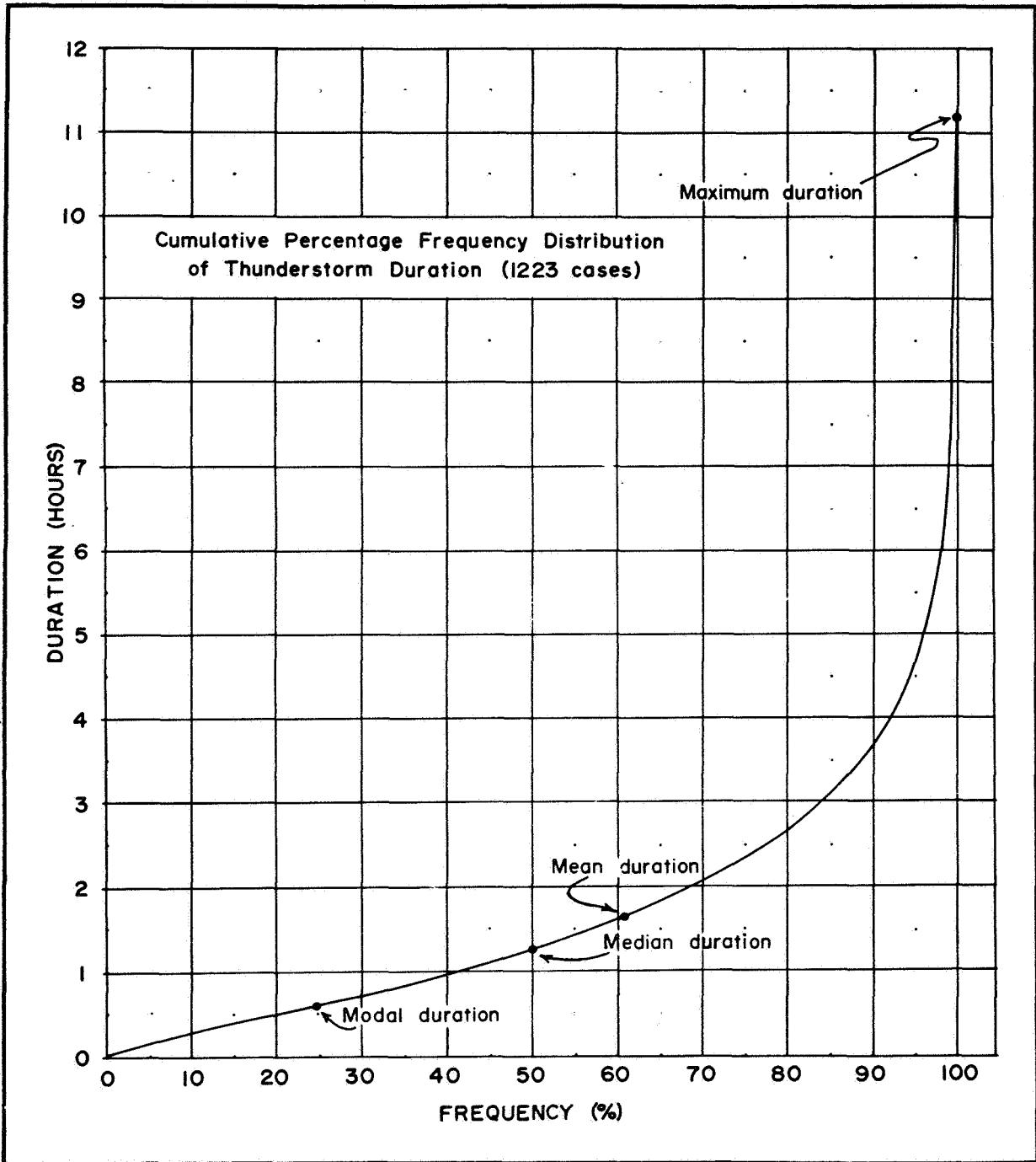


Figure 9: Cumulative percentage frequency distribution of thunderstorm duration.

## DURATION OF THUNDERSTORMS

Table 4 presents data on thunderstorm duration. With the exception of

Table 4. Mean Thunderstorm Duration Over Period of Record (Hours)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
0.5	1.3	1.6	1.4	1.8	1.6	2.0	1.8	1.5	1.2	2.2	1.0	1.7

the month of November, the general trend is for summer thunderstorms to last longer than those of winter and, according to Table 4, the average duration of July storms is four times greater than those of January. The 2.2 hour average duration of November storms seems excessive when compared to the adjacent months and is due to the fact that on one occasion continuous thunder was recorded for 11 hours 10 minutes, and only 15 thunderstorms were recorded this month during the 13-year period of record.

Figure 9 presents the cumulative percentage frequency distribution of the duration of all 1223 thunderstorms. The mean duration is 1.7 hours. The median duration is considerably shorter, 1.3 hours while the poorly defined modal duration is only about 36 minutes. The maximum duration of 11 hours 10 minutes occurred November 15-16, 1951, in advance of a strong cold front approaching Cape Kennedy from the northwest.

As mentioned in footnote 1, a thunderstorm is considered ended when at least 15 minutes passes without thunder being heard by the weather observer. For operational requirements, a much longer period of waiting would normally be required between individual thunderstorms before resuming normal out-of-doors activity. A thunderstorm which ended say, 1500 and resumed again at 1520 would probably have the same effect on scheduling outside activity as would one which continued uninterrupted between 1500 and 1520. With this restriction in mind, the average thunderstorm duration was recomputed for a 75-minute break and for a 135-minute break before a thunderstorm was considered ended. This would have no effect on the single thunderstorm occurrences but would tend to merge certain of the multi-occurrences of thunderstorms on single days. The effect, as expected, was to lengthen the average duration the order of 15 or 20%. Specific values are shown on Figure 10. If, for example, two hours between individual thunderstorms is required, the average duration is about 2.1 hours.

forecaster needs to know the probability of at least one additional occurrence. Formula (6) then becomes:

$$P_c(k+1,k) = P(k+1)/P(k) \quad P(k) > 0 \quad (7)$$

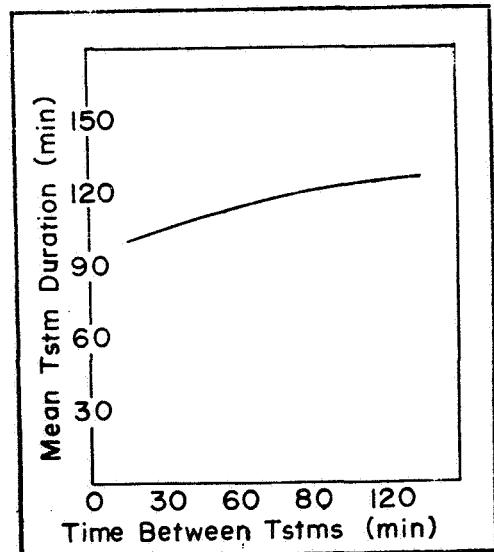
Example: Given that on day number 216 thunderstorms have occurred every afternoon for the past four days; that is, on days 213, 214, 215, and 216. What is the probability of another occurrence on day 217?

Procedure: Go back to the day the run started (day 213) and substitute appropriate values into formula (7) from Table C. Specifically,

$$P_c(5,4) = P(5)/P(4) = 13.8/19.0 = 72.6\%.$$

For convenience, these "one-additional-day" probabilities have been computed for the months May through September. These computations are included in the Appendix as Table D. Note that in Table D, the conditional probabilities computed from small data samples have been signaled. These latter probabilities should be used with caution. In particular, the indicated probabilities of 0% and 100% should definitely not be used.

Figure 10. Average Duration of Thunderstorms at Cape Kennedy as a Function of the Time Between Individual Thunderstorms.



## RUNS OF CONSECUTIVE DAYS WITH THUNDERSTORMS AND CONDITIONAL PROBABILITIES

Forecasting experience in Florida has shown that summertime daytime thunderstorms (as well as many other meteorological parameters) tend to be persistent from one day to the next. The following sequence, where Y represents a thunderstorm occurrence and N represents a non-occurrence is more or less typical of mid-summer:

N Y Y Y Y Y N N N Y Y Y Y Y Y N Y N N Y Y Y N N N N N N.

In this sequence, there are four "runs" of thunderstorm occurrence where a "run" is defined as an unbroken sequence of a particular event. In order of occurrence, these runs were of absolute duration, 5, 6, 1, and 3 days. For lack of any other qualifying information, the forecaster would have done quite well with a simple persistence forecast. He would, in fact, have verified 11 out of 15 'yes' forecasts and 8 out of 12 'no' forecasts.

A 15-day moving average of the observed frequency of runs of afternoon-type thunderstorms from one to ten days duration starting on any day of the year is included in the Appendix as Table C, pages C1 through C7. Attention is directed to the fact that these data are cumulative. On day 213, for example, the frequency of a run of at least one-day duration is 50.8% while the frequency of at least 2-days duration is 35.4%. The frequency of duration exactly one-day is therefore 50.8-35.4 or 15.4%.

The cumulative nature of these data given in Table C facilitates the computation of conditional probabilities. In the precise mathematical sense, a conditional probability can be stated (Hoel, 1956) as:

$$P(A_2|A_1) = P(A_1 A_2)/P(A_1) \quad P(A_1) > 0 \quad (5)$$

That is to say, the probability of  $A_2$  occurring under the condition that  $A_1$  has already occurred (conditional probability) is equal to the probability of the joint occurrence of both  $A_2$  and  $A_1$  divided by the probability of  $A_1$  alone. By assuming that the frequencies listed in Table C are good estimates of the probabilities, these data can be substituted in formula (5). In terms of the data of Table C, formula (5) can be restated as:

$$P_c(k+j, k) = P(k+j)/P(k) \quad P(k) > 0 \quad (6)$$

where  $P_c(k+j, k)$  is the probability of a run lasting  $j$ -additional days under the condition of having already lasted  $k$ -days,  $P(k+j)$  is the cumulative probability on day  $k+j$ , and  $P(k)$  is the cumulative probability on day  $k$ , the latter having already occurred. Properly used, these conditional probabilities can be quite useful to the operational forecaster. For most operational forecasting requirements,  $j$  will equal 1. That is, thunderstorms will have occurred the last  $k$  afternoons and the

## APPENDIX

The Appendix contains:

- 1) Table A---Tabular data from which Figure 7 was prepared.
- 2) Table B---Tabular data from which Figure 8 was prepared.
- 3) Table C---Observed frequencies of runs of afternoon-type (1000-2200EST) thunderstorms.
- 4) Table D---Conditional probabilities of one additional afternoon-type thunderstorm, having already occurred on I preceding afternoons,  $I = 1, 9$ .
- 5) Table E---The number of each day of the year.
- 6) Table F---A chronological listing of all reports of thunderstorms at Cape Kennedy, 1951, 1952, and 1957 through 1967 as contained on the master tape used for the data summaries contained within this report.
  - a) Twenty-four hours were added to the ending time of a thunderstorm if the ending time was after midnight. For example, on July 6, 1951, the ending time of the second thunderstorm of 2700 indicates that it ended at 0300 on July 7.
  - b) On days without a thunderstorm entry (for example, April 20, 1951), a thunderstorm which had begun on the previous day extended beyond midnight but a thunderstorm did not actually begin on this day.

## SUMMARY

It is recommended that the thunderstorm data contained within this report be used for planning purposes for all Spaceflight missions at Cape Kennedy for prognostic periods of beyond 5 days. For shorter range periods, forecasts of the low-tropospheric wind flow at launch time should enable the forecaster to refine the probabilities. In general, with westerly or with light and variable low-tropospheric winds higher probabilities should be forecast whereas, with easterly winds, lower values should be forecast. Such a probability study based on the 3000 ft. winds is currently being prepared and will be issued as a subsequent part of this study.

## ACKNOWLEDGMENTS

Special thanks are due Mr. Dale Martin for his excellent drafting work on the Figures contained within this report and to Mr. John Hope for his useful comments on some of the statistical techniques. Both Mr. Martin and Mr. Hope are members of the Miami Section of the Spaceflight Meteorology Group.

REFERENCES

Byers, H. R. and H. R. Rodebush, 1948: Causes of Thunderstorms of the Florida Peninsula, *J. Meteor.*, 275-280.

United States Weather Bureau, 1952: Mean Number of Thunderstorm Days in the United States, Technical Paper No. 19., Washington, D. C.

Brooks, C. E. P. and N. Carruthers, 1953: Handbook of Statistical Methods in Meteorology, Great Britain Meteorological Office Publication 538, London, Section 17.3, page 332.

Hoel, P. G., 1955: Introduction to Mathematical Statistics, second edition, John Wiley and Sons., Inc., New York, pages 8, 9, and 10.

Landsberg, H., 1958: Physical Climatology, Second Edition, Gray Printing Company, DuBois, Pennsylvania, page 257.

ESSA Weather Bureau, 1966: Local Climatological Data with Annual Summary and Comparative Data, Ashville, N. C.

Frank, N.L., P.L. Moore, and G.E. Fisher, 1967: Summer Shower Distribution over the Florida Peninsula as Deduced from Digitized Radar Data, *Journal of Applied Meteorology*, 309, 316.

Table A

DAYNR	C O N S E C U T I V E							N U M B E R	O F	D A Y	S O N G				
	1	2	3	4	5	6	7	DAYNR	1	2	3	4	5	6	7
1	1.0	2.1	2.6	2.6	2.6	3.6	4.6*	123	12.8	24.6	35.9	47.2	59.0	69.2	76.9*
2	1.0	1.5	1.5	1.5	2.6	3.6	5.1*	124	15.9	27.7	39.5	51.3	52.6	71.3	78.5*
3	0.5	0.5	0.5	1.5	2.6	4.1	6.2*	125	17.4	29.7	41.2	52.8	63.1	71.8	77.9*
4	0.0	0.0	1.0	2.1	3.6	5.6	7.7*	126	19.0	31.3	42.6	52.8	63.1	70.8	76.9*
5	0.0	1.0	2.1	3.6	5.6	7.7	9.7*	127	19.5	30.8	41.1	51.8	61.0	68.1	75.4*
6	1.0	2.1	3.6	5.6	7.7	9.7	11.8*	128	19.0	29.2	42.9	50.3	59.5	67.4	74.4*
7	1.0	2.1	3.6	5.6	7.7	9.7	12.9*	129	17.1	28.5	40.2	50.3	59.5	67.4	74.4*
8	1.5	3.6	5.6	7.7	9.7	11.8*	12.9*	130	18.5	29.2	49.2	59.5	67.7	75.4*	82.5*
9	2.1	4.1	6.2	8.2	10.3	12.8	15.4*	131	18.5	30.3	40.5	51.3	61.5	72.3	76.9*
10	2.1	4.1	6.2	8.2	10.8	13.3	15.9*	132	19.5	31.8	43.1	54.4	65.1	72.8	79.5*
11	2.1	4.1	6.2	8.7	11.3	13.8	16.4*	133	21.0	34.4	46.6	57.1	67.7	75.0	80.0*
12	2.1	4.1	6.7	9.2	11.8	14.4	16.9*	134	23.6	37.4	49.4	50.5	70.3	75.4	79.5*
13	2.1	4.6	7.2	9.7	12.3	14.9	17.4*	135	24.6	30.0	51.3	52.6	69.2	73.3	77.4*
14	2.6	5.1	6.7	8.2	10.8	13.4	17.4*	136	26.2	30.5	47.4	50.5	69.2	73.3	77.4*
15	2.6	5.1	7.1	8.3	12.8	15.9*	17.4*	137	26.2	41.0	48.4	50.5	69.2	73.3	77.4*
16	2.6	5.1	7.7	10.3	12.8	16.6	15.9*	138	28.2	41.5	50.3	52.6	69.2	73.3	77.4*
17	2.6	5.1	7.7	10.3	11.8	13.3	14.4*	139	26.7	40.3	48.7	56.4	62.1	67.2	73.3*
18	2.6	5.1	7.7	9.2	10.8	11.8	12.3*	140	26.2	39.5	48.7	56.4	62.1	68.2	74.4*
19	2.6	5.1	6.7	8.2	9.2	9.7	10.3*	141	24.6	39.0	48.2	53.9	62.2	75.4	26.3*
20	2.6	4.1	5.6	6.7	7.2	7.7	8.2*	142	26.2	40.5	49.4	57.9	65.1	71.6	77.4*
21	1.5	3.6	4.1	4.6	5.2	6.2*	6.2*	143	26.7	41.5	50.9	52.5	66.3	73.3	78.5*
22	1.0	2.6	3.1	3.6	4.1	4.6*	5.2*	144	27.6	32.4	42.6	50.3	62.3	68.2	74.4*
23	1.0	2.6	3.1	3.6	4.1	4.6*	5.2*	145	27.1	32.4	42.6	48.7	74.4	79.4*	82.5*
24	0.5	1.0	2.1	2.1	3.1	4.1	5.6*	146	28.2	43.6	53.8	62.6	68.7	74.9	82.5*
25	0.5	1.0	1.5	2.6	3.6	5.1	6.7*	147	29.2	44.1	54.6	62.6	69.2	75.9	81.0*
26	0.5	1.0	2.1	3.1	4.1	6.2	9.2*	148	29.2	44.6	56.6	53.1	70.3	81.0	81.5*
27	0.5	1.5	2.6	4.1	5.6	8.7	11.8*	149	29.7	44.6	55.6	61.6	71.5	77.4	82.1*
28	1.0	2.1	3.6	5.1	5.6	8.1	11.3*	150	30.8	55.6	67.2	66.2	73.3	79.0	83.6*
29	1.0	2.1	4.1	7.2	10.3	13.3	16.4*	151	31.1	47.3	59.2	77.7	80.4	84.1*	280
30	1.0	2.1	4.1	7.2	10.3	13.3	16.4*	152	33.3	49.2	59.2	80.9	84.1	84.1*	281
31	1.5	2.1	5.1	8.7	12.8	14.9	19.0	153	31.1	46.7	57.0	65.5	72.3	79.4	84.4*
32	3.6	7.2	10.8	13.8	17.9	22.1	26.2*	154	33.3	48.7	61.0	63.2	75.9	81.0	84.1*
33	4.1	7.7	11.3	15.4	19.5	23.6	27.7*	155	32.8	49.2	61.5	59.2	75.9	82.5	84.4*
34	4.1	7.7	12.3	16.4	20.5	24.6	28.7*	156	34.4	49.2	61.5	70.3	76.4	80.5	83.6*
35	4.1	8.7	13.3	17.4	21.5	25.6	30.3*	157	33.3	49.2	62.3	73.8	76.4	80.5	83.6*
36	5.1	9.7	14.4	18.5	22.4	27.2	31.8*	158	34.4	50.8	63.3	71.3	77.4	81.0	84.1*
37	5.1	9.7	14.4	18.5	23.4	27.7	32.3*	159	35.9	51.8	64.1	71.8	77.4	81.0	84.1*
38	5.1	9.7	14.4	18.5	23.4	27.7	32.4*	160	36.9	52.0	64.1	71.8	77.4	81.0	84.1*
39	5.1	9.7	14.9	19.5	24.1	28.1	32.8*	161	31.1	46.7	57.0	72.1	79.2	85.6*	283
40	5.1	10.3	15.4	20.0	24.1	27.7	31.3*	162	30.9	64.4	65.1	73.3	79.5	86.8*	284
41	5.6	10.4	15.9	20.0	23.3	27.2	29.7*	163	39.5	53.8	65.1	72.8	79.0	84.1	285
42	5.6	10.8	19.0	22.2	25.1	28.1	28.2*	164	39.0	63.8	65.1	72.3	79.5	86.8*	286
43	5.6	10.8	14.4	17.9	20.3	23.6	26.7*	165	39.5	64.9	65.6	73.3	73.0	80.5	84.4*
44	5.6	9.2	13.3	15.9	19.4	22.1	25.1*	166	40.0	64.6	65.7	74.4	81.0	82.8	87.7*
45	4.6	8.7	11.3	14.4	17.9	20.5	22.6*	167	39.0	55.9	67.1	75.4	82.1	87.2	89.7*
46	4.6	7.6	10.3	13.3	16.4	20.5	23.1*	168	41.0	59.2	66.7	75.4	82.1	87.2	89.7*
47	4.6	7.6	10.3	13.3	16.4	19.5*	20.0*	169	40.6	57.8	66.7	75.4	82.1	87.2	89.7*
48	3.1	6.2	9.2	11.3	13.8	16.4	19.0*	170	44.6	62.1	72.2	79.5	86.2	91.3	93.3*
49	3.1	6.2	8.2	10.8	13.8	15.9	19.0*	171	46.7	64.1	71.8	81.0	87.2	92.4	96.9*
50	3.1	5.1	7.7	10.3	12.8	15.9	19.0*	172	47.1	65.1	74.4	81.5	87.8	93.8	95.4*
51	2.1	4.6	7.2	9.7	12.8	15.9	19.0*	173	48.2	65.6	74.9	82.6	89.7	94.4	96.4*
52	2.6	5.1	7.7	10.8	13.8	16.9	19.5*	174	48.2	65.6	75.9	84.2	88.0	92.8	95.4*
53	2.6	5.1	7.7	10.8	13.8	16.9	19.5*	175	48.2	65.6	75.9	84.2	88.0	92.8	95.4*
54	2.6	5.1	7.7	10.8	13.8	16.9	19.5*	176	48.2	65.6	75.9	84.2	88.0	92.8	95.4*
55	2.6	5.1	7.7	10.8	13.8	16.9	19.5*	177	48.2	65.6	75.9	84.2	88.0	92.8	95.4*
56	1.1	0.7	9.7	12.0	15.9	19.0	21.5*	178	50.2	70.8	72.1	84.1	93.8	96.4	97.4*
57	3.6	6.7	9.7	12.8	16.4	19.0	21.0*	179	51.1	73.1	82.4	88.2	92.9	96.9	98.4*
58	3.1	6.2	9.2	12.8	15.9	17.9	21.5*	180	52.3	70.8	72.1	84.7	93.8	96.4	98.4*
59	3.1	6.2	9.7	12.8	15.4	19.0	23.6*	181	52.8	70.3	73.5	85.8	91.3	95.4	98.4*
60	3.1	6.2	9.7	12.3	16.1	21.0	26.2*	182	51.3	67.1	70.4	80.0	84.4	87.0	92.5*
61	3.6	6.7	9.2	13.3	18.5	23.6	29.2*	183	49.1	66.2	76.9	84.1	94.6	96.9	98.4*
62	3.1	5.6	9.7	14.9	20.5	24.0	27.0*	184	51.1	67.4	70.4	81.5	86.5	92.8	96.4*
63	2.6	5.1	6.7	11.7	21.0	24.0	27.0*	185	49.4	65.4	66.7	80.3	84.3	90.4	94.4*
64	4.1	6.2	14.9	21.0	27.2	30.7*	32.7*	186	47.1	67.4	71.6	84.8	91.7	94.8	97.4*
65	4.1	6.2	14.9	21.0	27.2	30.7*	32.7*	187	47.1	67.4	71.6	84.8	91.7	94.8	97.4*
66	6.7	8.2	11.8	17.4	21.9	24.0	30.4*	188	47.2	65.6	73.9	82.1	86.7	90.2	98.2*
67	8.2	14.9	21.0	27.2	32.7	35.9	40.7*	189	47.2	65.6	73.9	82.1	86.7	90.2	98.2*
68	9.2	15.9	21.0	27.2	33.4	36.6	40.7*	190	47.2	65.6	73.9	82.1	86.7	90.2	98.2*
69	9.2	15.9	21.0	27.2	33.4	36.6	40.7*	191	47.2	65.6	73.9	82.1	86.7	90.2	98.2*
70	9.2	15.9	21.0	27.2	33.4	36.6	40.7*	192	47.2	65.6	73.9	82.1	86.7	90.2	98.2*
71	9.2	15.9	21.0	27.2	33.4	36.6	40.7*	193	49.1	55.9	65.6	75.4	82.1	86.7	90.2*
72	9.2	15.9	21.0	27.2	33.4	36.6	40.7*	194	51.3	70.3	81.5	86.7	90.2	94.4	98.4*
73	10.3	16.9	21.0	27.2	33.4	36.6	40.7*	195	49.2	55.9	65.6	75.4	82.1	86.7	90.2*
74	10.8	17.4	24.0	30.3	37.4	43.1	48.2*	196	42.1	55.9	66.7	79.0	83.1	88.7	97.8*
75	10.8	17.4	24.0	31.1	37.4	43.1	47.7*	197	43.1	56.9	66.2	79.4	83.1	88.7	97.8*
76	10.8	17.9													

Table B

DAYNR	***C U N S E C U T I V E N U M B E R												DAYNR	***C U N S E C U T I V E N U M B E R																	
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4						
1	0.5	1.0	1.0	1.0	1.0	1.5	2.1*	123	11.3	21.0	29.7	19.5	49.7	58.9	65.6*	265	31.3	48.2	61.5	70.3	78.5	85.2	90.8*	1	2	3	4	5	6	7	
2	0.5	0.5	0.5	0.5	1.0	1.5	2.6*	124	13.8	23.1	32.8	43.1	52.4	60.7	67.2*	246	30.8	47.2	60.5	69.7	78.5	85.2	91.3*	1	2	3	4	5	6	7	
3	0.0	0.0	0.0	0.5	1.0	2.1	3.1*	125	13.8	24.2	34.9	44.6	53.3	61.0	67.2*	247	30.3	46.7	60.4	69.7	78.5	86.7	91.8*	1	2	3	4	5	6	7	
4	0.0	0.0	0.5	1.0	2.1	3.1	3.1	41.1*	126	14.9	26.2	35.9	44.6	53.4	60.5	66.7*	248	29.2	46.2	59.9	69.2	79.0	86.7	92.3*	1	2	3	4	5	6	7
5	0.0	0.0	1.0	2.1	3.1	4.1	5.1*	127	15.9	26.2	34.9	44.6	53.4	59.5	66.2*	249	29.2	46.2	59.5	70.3	79.5	87.7	92.8*	1	2	3	4	5	6	7	
6	0.5	1.0	1.0	1.0	1.0	1.5	2.1*	128	12.1	24.2	34.6	44.6	51.8	59.8	65.6*	250	29.7	46.1	61.9	73.3	81.1	87.7	92.3*	1	2	3	4	5	6	7	
7	0.0	1.5	2.0	2.6	3.1	3.6	4.6	5.6*	129	14.9	25.1	34.4	43.4	52.8	60.5	67.2*	251	29.1	46.2	61.2	72.0	80.0	87.7	92.3*	1	2	3	4	5	6	7
8	1.0	2.0	3.1	4.1	5.1	6.2	7.2*	130	15.6	25.6	34.9	44.1	53.3	60.5	68.2*	252	32.1	49.2	62.6	71.8	79.5	85.6	90.8*	1	2	3	4	5	6	7	
9	1.0	2.1	3.1	4.1	5.1	6.2	7.2*	131	15.4	26.7	36.4	46.2	55.2	63.1	70.1*	253	31.1	47.7	60.0	68.7	76.4	82.6	87.2*	1	2	3	4	5	6	7	
10	1.0	2.1	3.1	4.1	5.1	6.2	7.2*	132	16.4	28.7	39.6	49.2	59.5	66.1	73.3*	254	27.7	45.1	56.9	65.6	73.3	79.5	85.1*	1	2	3	4	5	6	7	
11	1.0	2.1	3.1	4.1	5.1	6.2	7.2*	133	16.5	31.3	42.1	53.3	62.4	69.7	74.4*	255	28.7	43.1	53.4	62.1	70.3	77.4	83.1*	1	2	3	4	5	6	7	
12	1.0	2.1	3.1	4.1	5.1	6.2	7.2*	134	20.5	33.4	45.6	55.9	65.1	70.1	74.9*	256	27.2	40.0	50.4	59.5	68.7	75.	81.0*	1	2	3	4	5	6	7	
13	1.0	2.1	3.1	4.1	5.1	6.2	7.2*	135	21.5	36.4	47.4	57.9	64.2	69.1	73.3*	257	25.1	37.9	49.2	59.0	67.7	73.4	79.0*	1	2	3	4	5	6	7	
14	1.0	2.1	3.1	4.1	5.1	6.2	7.2*	136	21.5	36.4	48.2	58.6	65.6	69.1	72.2*	258	23.6	34.9	46.2	56.4	65.7	73.4	79.1*	1	2	3	4	5	6	7	
15	1.0	2.1	3.1	4.1	5.1	6.2	7.2*	137	23.1	37.9	48.9	59.1	61.5	66.2	70.3*	259	23.6	34.9	46.2	56.4	65.7	73.4	79.1*	1	2	3	4	5	6	7	
16	1.0	2.1	3.1	4.1	5.1	5.6	6.2*	138	25.1	38.5	47.7	55.4	61.0	65.6	70.3*	260	24.1	36.4	47.2	56.4	65.1	70.3	75.4*	1	2	3	4	5	6	7	
17	1.0	2.1	3.1	4.1	5.1	5.1	5.1*	139	24.1	37.9	46.7	54.4	60.0	65.1	70.3*	261	23.1	35.4	46.2	55.9	63.6	68.7	72.8*	1	2	3	4	5	6	7	
18	1.0	2.1	3.1	4.1	5.1	4.1	4.1*	140	25.1	37.9	47.4	54.9	60.5	67.2	73.3	262	23.1	36.9	46.2	55.4	62.6	66.7	70.8*	1	2	3	4	5	6	7	
19	1.0	2.1	3.1	3.6	3.1	3.1	3.1*	141	24.1	37.9	47.2	54.9	61.0	67.2	73.3*	263	23.1	35.4	46.2	54.9	61.0	65.1	68.2*	1	2	3	4	5	6	7	
20	1.0	2.1	3.1	2.1	2.1	2.1	2.1*	142	25.6	39.5	48.7	56.4	63.6	70.3	75.4*	264	24.1	35.9	46.2	53.8	59.5	62.4	66.2*	1	2	3	4	5	6	7	
21	0.5	1.0	1.0	1.0	1.0	1.0	1.0*	143	26.2	40.2	49.0	57.9	65.1	71.3	76.9*	265	24.1	34.9	44.6	51.8	56.4	60.0	63.6*	1	2	3	4	5	6	7	
22	0.5	1.0	1.0	1.0	1.0	1.0	1.0*	144	25.5	39.1	48.6	57.3	64.5	70.3	75.4*	266	23.1	34.2	43.9	50.4	55.1	59.8	63.6*	1	2	3	4	5	6	7	
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0*	145	25.7	39.7	48.2	57.0	64.3	70.1	75.3*	267	23.1	34.2	43.9	50.4	55.1	59.8	63.6*	1	2	3	4	5	6	7	
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0*	146	25.5	39.7	48.2	57.0	64.3	70.1	75.3*	268	23.1	34.2	43.9	50.4	55.1	59.8	63.6*	1	2	3	4	5	6	7	
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0*	147	25.2	42.1	51.8	60.5	66.7	72.8	78.5*	269	19.0	28.2	35.9	43.6	49.7	54.6	57.9*	1	2	3	4	5	6	7	
26	0.0	0.0	0.0	0.5	1.5	3.1	3.1*	148	27.7	42.6	52.8	60.5	67.2	73.3	78.5*	270	17.4	26.7	35.4	43.1	48.7	52.8	56.6*	1	2	3	4	5	6	7	
27	0.0	0.5	1.5	3.1	3.1	3.6	4.6*	149	28.2	42.4	52.8	60.5	67.2	73.3	78.5*	271	21.1	27.2	35.4	42.6	47.7	51.8	55.4*	1	2	3	4	5	6	7	
28	0.5	1.5	3.1	4.6	6.6	6.7	6.7*	150	29.2	43.4	56.6	61.5	68.2	74.6	79.5*	272	17.4	26.7	34.4	41.0	46.2	50.3	53.8*	1	2	3	4	5	6	7	
29	1.0	2.1	3.1	4.1	6.2	8.2	10.3*	151	29.7	43.4	56.6	61.5	68.2	74.7	79.5*	273	16.4	25.1	32.3	39.0	44.1	48.2	51.8*	1	2	3	4	5	6	7	
30	1.5	3.1	4.6	7.1	8.2	9.2	10.3*	152	29.5	43.6	55.4	60.6	67.9	74.9	79.5*	274	14.9	23.1	30.2	36.9	42.1	46.2	50.8*	1	2	3	4	5	6	7	
31	1.0	2.1	3.1	4.1	5.1	6.1	7.1*	153	15.9	20.4	30.8	39.0	48.2	57.4	66.0*	275	19.1	26.7	33.1	40.1	47.1	52.1	58.1*	1	2	3	4	5	6	7	
32	2.6	5.1	7.1	9.7	12.3	14.9	17.4*	154	10.8	20.4	30.8	39.0	48.2	57.4	66.0*	276	14.4	22.6	29.2	36.9	40.5	45.1	49.2*	1	2	3	4	5	6	7	
33	3.1	5.6	8.2	10.8	12.3	14.9	17.4*	155	10.8	20.4	30.8	39.0	48.2	57.4	66.0*	277	14.4	22.6	29.2	36.9	40.5	45.1	49.2*	1	2	3	4	5	6	7	
34	3.1	5.6	8.2	10.8	12.3	14.9	17.4*	156	10.8	20.4	30.8	39.0	48.2	57.4	66.0*	278	14.4	22.6	29.2	36.9	40.5	45.1	49.2*	1	2	3	4	5	6	7	
35	3.1	5.6	8.2	10.8	12.3	14.9	17.4*	157	10.8	20.4	30.8	39.0	48.2	57.4	66.0*	279	13.8	20.0	26.2	31.8	36.9	42.1	46.2*	1	2	3	4	5	6	7	
36	3.1	5.6	8.2	10.8	12.3	14.9	17.4*	158	10.8	20.4	30.8	39.0	48.2	57.4	66.0*	280	13.8	20.0	26.2	31.8	36.9	42.1	46.2*	1	2	3	4	5	6	7	
37	3.1	5.6	8.2	10.8	12.3	14.9	17.4*	159	10.8	20.4	30.8	39.0	48.2	57.4	66.0*	281	13.8	20.0	26.2	31.8	36.9	42.1	46.2*	1	2	3	4	5	6	7	
38	3.1	5.6	8.2	10.8	12.3	14.9	17.4*	160	10.8	20.4	30.8	39.0	48.2	57.4	66.0*	282	13.8	20.0	26.2	31.8	36.9	42.1	46.2*	1	2	3	4	5	6	7	
39	3.1	5.6	8.2	10.8	12.3	14.9	17.4*	161	10.8	20.4	30.8	39.0	48.2	57.4	66.0*	283	13.8	20.0	26.2	31.8	36.9	42.1	46.2*	1	2	3	4	5	6	7	
40	3.1	5.6	8.2	10.8	12.3	14.9	17.4*	162	10.8	20.4	30.8	39.0	48.2	57.4	66.0*	284	13.8	20.0	26.2	31.8	36.9	42.1	46.2*	1	2	3	4	5	6	7	
41	3.1	5.6	8.2	10.8	12.3	14.9	17.4*	163	10.8	20.4	30.8	39.0	48.2	57.4	66.0*	285	13.8	20.0	26.2	31.8	36.9	42.1	46.2*	1	2	3	4	5	6	7	
42	3.1	5.6	8.2	10.8	12.3	14.9	17.4*	164	10.8																						

TABLE C

LENGTH OF TSTM RUN IN CONSECUTIVE DAYS(K)

DAY NUMBER	I	K=1	K=2	K=3	K=4	K=5	K=6	K=7	K=8	K=9	K=10
1	I	0.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
2	I	0.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
3	I	0.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
4	I	0.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
5	I	0.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
6	I	0.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
7	I	0.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
8	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
9	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
10	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
11	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
12	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
13	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
14	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
15	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
16	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
17	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
18	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
19	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
20	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
21	I	0.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
22	I	0.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
23	I	0.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
24	I	0.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
25	I	0.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
26	I	0.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
27	I	0.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
28	I	0.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
29	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
30	I	1.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
31	I	1.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
32	I	2.6	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
33	I	3.1	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
34	I	3.1	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
35	I	3.1	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
36	I	3.6	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
37	I	3.6	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
38	I	3.6	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
39	I	3.6	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
40	I	3.6	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
41	I	3.6	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
42	I	3.6	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
43	I	3.1	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
44	I	2.6	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
45	I	2.1	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
46	I	2.1	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
47	I	1.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
48	I	1.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
49	I	1.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
50	I	1.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
51	I	1.0	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
52	I	1.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0
53	I	1.5	0.0	0.0	0.0	C.0	0.0	0.0	0.0	0.0	0.0

Percentage occurrence of afternoon-type (1000-2200EST)  
Thunderstorm runs at Cape Kennedy

TABLE C

LENGTH OF TSTM RUN IN CONSECUTIVE DAYS(K)

DAY	I	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	K <sub>5</sub>	K <sub>6</sub>	K <sub>7</sub>	K <sub>8</sub>	K <sub>9</sub>	K <sub>10</sub>
NUMBER	I	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	K <sub>5</sub>	K <sub>6</sub>	K <sub>7</sub>	K <sub>8</sub>	K <sub>9</sub>	K <sub>10</sub>
54	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	I	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	I	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	I	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	I	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	I	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	I	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	I	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	I	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	I	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65	I	4.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	I	5.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	I	5.6	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	I	6.2	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
69	I	6.7	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	I	6.7	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	I	6.7	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	I	7.2	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73	I	7.7	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	I	8.2	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	I	8.2	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76	I	8.2	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77	I	8.7	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	I	8.7	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	I	8.2	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	I	7.2	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
81	I	6.7	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
82	I	7.2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
83	I	7.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84	I	9.2	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	I	10.8	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86	I	10.3	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87	I	10.3	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88	I	9.7	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89	I	9.2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	I	9.7	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	I	9.2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
92	I	9.2	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	I	10.3	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94	I	9.7	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95	I	10.8	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	I	11.3	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97	I	9.7	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
98	I	8.7	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
99	I	7.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	I	5.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	I	5.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	I	5.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
103	I	6.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
104	I	6.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105	I	6.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
106	I	6.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE C

## LENGTH OF TSTM RUN IN CONSECUTIVE DAYS(K)

DAY NUMBER	I	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	K <sub>5</sub>	K <sub>6</sub>	K <sub>7</sub>	K <sub>8</sub>	K <sub>9</sub>	K <sub>10</sub>
107	I	6.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	I	6.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109	I	7.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110	I	6.7	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111	I	7.2	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
112	I	7.2	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
113	I	8.2	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
114	I	9.7	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115	I	10.3	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
116	I	11.3	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
117	I	10.8	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
118	I	10.3	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
119	I	10.3	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	I	10.3	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
121	I	10.8	4.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
122	I	11.8	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123	I	11.3	4.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
124	I	13.8	4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	I	13.8	4.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
126	I	14.3	4.6	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0
127	I	15.9	5.1	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0
128	I	15.4	5.1	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0
129	I	14.4	4.0	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0
130	I	15.4	5.1	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0
131	I	15.4	5.1	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0
132	I	16.4	6.2	2.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0
133	I	18.5	7.7	3.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0
134	I	20.5	8.2	3.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0
135	I	21.5	8.2	3.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0
136	I	23.1	8.7	3.6	1.5	0.5	0.0	0.0	0.0	0.0	0.0
137	I	23.1	9.2	4.1	2.1	0.5	0.0	0.0	0.0	0.0	0.0
138	I	25.1	9.7	4.6	2.1	0.5	0.0	0.0	0.0	0.0	0.0
139	I	24.1	10.3	4.1	2.1	0.5	0.0	0.0	0.0	0.0	0.0
140	I	25.1	10.3	4.6	2.0	0.5	0.0	0.0	0.0	0.0	0.0
141	I	24.1	10.8	4.6	2.1	0.5	0.0	0.0	0.0	0.0	0.0
142	I	25.6	11.3	4.6	2.1	0.5	0.0	0.0	0.0	0.0	0.0
143	I	26.2	11.3	4.6	2.1	0.5	0.0	0.0	0.0	0.0	0.0
144	I	26.7	11.8	4.6	2.1	0.5	0.0	0.0	0.0	0.0	0.0
145	I	26.7	11.8	4.6	2.1	0.5	0.0	0.0	0.0	0.0	0.0
146	I	27.2	12.3	5.1	2.6	1.0	0.5	0.5	0.0	0.0	0.0
147	I	28.2	12.8	6.2	3.6	1.5	1.0	0.5	0.0	0.0	0.0
148	I	27.7	12.3	7.2	4.1	2.1	1.0	0.5	0.0	0.0	0.0
149	I	28.2	13.8	8.2	5.1	2.6	1.5	0.5	0.0	0.0	0.0
150	I	29.2	14.4	8.7	5.6	3.1	1.5	0.5	0.0	0.0	0.0
151	I	29.7	15.4	8.7	5.6	2.6	1.5	0.5	0.0	0.0	0.0
152	I	31.3	16.4	9.2	5.1	2.6	1.5	0.5	0.0	0.0	0.0
153	I	30.8	16.9	8.7	5.1	2.6	1.5	0.5	0.0	0.0	0.0
154	I	30.8	16.4	9.2	5.1	2.6	1.5	0.5	0.0	0.0	0.0
155	I	30.3	16.9	9.2	5.1	3.1	2.1	1.0	0.5	0.0	0.0
156	I	31.8	17.4	9.7	5.6	3.6	2.6	1.5	0.5	0.0	0.0
157	I	30.8	17.4	9.7	6.2	4.1	3.1	1.5	0.5	0.0	0.0
158	I	31.8	18.5	10.3	6.7	4.6	3.1	1.5	0.5	0.0	0.0
159	I	33.3	20.0	11.3	7.7	4.6	3.1	1.5	0.5	0.0	0.0

TABLE C

LENGTH OF TSTM RUN IN CONSECUTIVE DAYS(K)

DAY	I	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	K <sub>5</sub>	K <sub>6</sub>	K <sub>7</sub>	K <sub>8</sub>	K <sub>9</sub>	K <sub>10</sub>
NUMBER	I	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	K <sub>5</sub>	K <sub>6</sub>	K <sub>7</sub>	K <sub>8</sub>	K <sub>9</sub>	K <sub>10</sub>
160	I	34.4	21.0	12.8	8.2	5.1	3.1	1.5	0.5	0.0	0.0
161	I	35.4	23.1	13.8	9.2	5.1	2.6	1.0	0.5	0.0	0.0
162	I	36.9	23.6	13.8	8.2	4.6	2.1	1.0	0.5	0.0	0.0
163	I	37.4	24.1	13.3	8.2	4.1	2.1	1.0	0.5	0.0	0.0
164	I	37.4	24.1	13.3	7.7	3.6	1.5	1.0	0.5	0.0	0.0
165	I	37.9	24.1	12.8	7.2	3.1	1.5	1.0	0.5	0.0	0.0
166	I	38.5	23.6	13.3	7.2	3.6	2.1	1.5	1.0	0.5	0.5
167	I	37.4	23.6	13.3	8.2	4.6	3.1	2.1	1.5	1.0	1.0
168	I	40.0	23.6	14.4	9.2	5.6	3.6	2.6	2.1	1.5	1.5
169	I	41.0	25.6	15.9	10.8	6.2	4.1	3.1	2.6	2.1	2.1
170	I	42.6	27.2	17.4	11.3	6.2	4.1	3.1	2.6	2.6	2.6
171	I	43.6	27.7	17.4	11.3	6.2	4.1	3.1	3.1	3.1	3.1
172	I	44.6	28.2	17.4	11.3	6.2	4.1	3.6	3.6	3.6	3.1
173	I	45.1	27.2	17.4	11.3	6.2	4.6	4.1	4.1	3.6	3.1
174	I	44.1	26.2	16.9	10.8	6.7	5.1	4.6	4.1	3.6	3.1
175	I	44.1	25.6	16.4	10.8	6.7	5.6	4.6	4.1	3.6	3.1
176	I	44.1	25.6	16.9	10.3	7.2	6.2	4.6	4.1	3.6	3.1
177	I	44.6	26.7	16.9	11.3	8.2	6.7	5.1	4.1	3.6	3.1
178	I	46.2	26.7	17.4	11.8	8.7	7.2	5.1	4.1	3.6	3.1
179	I	47.2	28.2	19.0	12.3	9.7	7.7	5.1	4.1	3.6	3.1
180	I	48.2	30.3	19.5	13.3	10.3	7.7	5.1	4.1	3.6	3.1
181	I	48.7	29.7	19.5	13.3	9.7	7.2	4.6	3.6	3.1	2.6
182	I	47.7	29.2	19.0	12.3	8.7	6.2	4.1	3.1	2.6	2.1
183	I	46.2	30.3	18.5	11.8	8.2	5.6	3.6	2.6	2.1	1.5
184	I	46.7	29.2	17.9	11.8	8.2	5.6	3.6	2.6	2.1	1.5
185	I	46.2	28.7	17.4	11.3	8.2	5.6	3.6	2.6	2.1	1.0
186	I	45.1	28.7	17.4	11.8	8.7	6.2	4.1	3.1	1.5	0.5
187	I	45.6	28.2	17.9	12.3	9.2	6.7	4.6	2.6	1.0	0.5
188	I	44.6	29.2	19.0	13.3	10.3	7.7	4.6	2.6	1.0	0.5
189	I	45.1	30.3	20.5	14.9	11.8	8.2	5.1	3.1	1.0	0.5
190	I	44.6	31.3	21.5	16.4	12.3	8.7	5.6	3.1	1.0	0.5
191	I	45.1	31.3	22.1	16.4	12.3	8.7	5.6	3.1	1.0	0.5
192	I	44.6	31.3	21.5	15.9	11.8	8.2	5.1	3.1	1.0	0.5
193	I	43.6	30.3	21.0	15.4	11.3	7.7	5.1	3.1	1.0	0.5
194	I	41.5	28.2	19.5	14.9	10.8	7.2	5.1	3.1	1.0	0.5
195	I	40.5	27.2	19.5	14.9	10.8	7.7	5.6	3.1	1.0	0.5
196	I	39.5	27.7	20.0	15.4	11.3	8.2	5.6	3.1	1.0	0.5
197	I	40.5	28.7	21.0	16.4	11.8	8.2	5.6	3.1	1.0	0.5
198	I	41.0	28.7	22.1	16.9	11.3	8.2	5.6	3.1	1.0	0.5
199	I	40.5	29.2	22.1	15.9	11.3	8.2	5.6	3.1	1.0	0.5
200	I	40.5	29.2	21.0	15.9	11.3	8.2	5.6	3.1	1.0	1.0
201	I	41.0	28.2	21.0	15.4	10.8	7.7	5.1	2.6	1.5	1.5
202	I	40.0	29.2	21.5	15.9	11.3	8.2	5.1	3.6	2.1	2.1
203	I	41.5	29.2	21.5	15.9	11.3	7.7	5.6	3.6	2.6	2.6
204	I	42.1	30.3	22.6	16.9	11.3	8.2	5.6	4.1	3.6	3.6
205	I	44.6	32.3	24.1	17.4	11.8	8.2	6.2	5.1	4.6	4.6
206	I	46.2	33.8	24.1	17.9	11.8	8.7	7.2	6.2	5.6	5.1
207	I	47.7	33.3	24.6	17.9	12.3	9.7	8.2	7.2	6.2	5.1
208	I	47.7	33.8	24.6	18.5	13.3	10.8	9.2	7.7	6.2	5.1
209	I	48.7	34.4	25.6	19.5	13.8	11.8	9.7	7.7	6.2	5.1
210	I	49.2	34.9	26.7	20.0	14.4	11.8	9.2	7.7	6.2	5.1
211	I	49.2	35.4	26.7	20.0	14.4	11.3	9.2	7.7	6.2	5.1
212	I	50.8	35.9	27.2	20.0	13.8	11.3	9.2	7.7	6.2	5.1

TABLE C

LENGTH OF TSTM RUN IN CONSECUTIVE DAYS(K)

DAY	I	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	K <sub>5</sub>	K <sub>6</sub>	K <sub>7</sub>	K <sub>8</sub>	K <sub>9</sub>	K <sub>10</sub>
NUMBER	I	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	K <sub>5</sub>	K <sub>6</sub>	K <sub>7</sub>	K <sub>8</sub>	K <sub>9</sub>	K <sub>10</sub>
213	I	50.8	35.4	26.7	19.0	13.8	11.3	9.2	7.7	6.2	5.1
214	I	51.3	35.4	26.2	18.5	13.3	10.8	8.7	7.2	5.6	4.6
215	I	52.3	34.9	25.6	17.9	12.8	10.3	8.2	6.7	5.1	4.1
216	I	51.3	33.8	24.6	17.4	12.3	9.7	7.7	6.2	4.6	3.6
217	I	49.7	31.8	23.1	15.9	10.8	8.2	6.7	5.1	4.1	3.1
218	I	47.7	31.3	22.1	14.9	9.7	7.2	5.6	4.6	3.6	2.6
219	I	47.7	30.3	20.5	13.3	8.2	5.6	4.6	3.6	2.6	1.5
220	I	46.7	28.2	19.0	11.8	7.2	5.1	3.6	2.6	1.5	0.5
221	I	45.6	26.7	17.9	11.3	7.2	4.1	2.6	1.5	0.5	0.0
222	I	43.6	26.2	17.9	11.3	6.2	3.1	1.5	0.5	0.0	0.0
223	I	44.6	27.2	19.0	10.8	5.6	2.1	0.5	0.0	0.0	0.0
224	I	45.1	27.2	17.4	9.7	4.6	1.0	0.0	0.0	0.0	0.0
225	I	43.6	25.1	15.9	8.2	3.6	0.5	0.0	0.0	0.0	0.0
226	I	43.1	24.6	14.9	7.7	3.6	1.0	0.0	0.0	0.0	0.0
227	I	43.1	23.6	13.8	7.7	4.1	1.0	0.0	0.0	0.0	0.0
228	I	41.5	22.6	13.8	8.2	4.1	1.0	0.0	0.0	0.0	0.0
229	I	40.0	22.6	13.3	8.2	4.1	1.0	0.0	0.0	0.0	0.0
230	I	40.5	23.1	13.3	8.2	4.1	1.0	0.0	0.0	0.0	0.0
231	I	40.5	23.1	13.3	8.2	4.1	1.0	0.0	0.0	0.0	0.0
232	I	41.0	24.1	13.3	8.2	4.1	1.0	0.0	0.0	0.0	0.0
233	I	42.1	23.6	12.8	7.7	3.6	1.0	0.0	0.0	0.0	0.0
234	I	41.0	22.1	11.3	6.2	3.1	1.0	0.0	0.0	0.0	0.0
235	I	39.0	20.0	9.2	5.1	2.6	0.5	0.0	0.0	0.0	0.0
236	I	36.9	17.9	8.2	4.6	2.1	0.5	0.0	0.0	0.0	0.0
237	I	34.9	16.9	7.7	4.6	2.1	0.5	0.0	0.0	0.0	0.0
238	I	33.3	16.4	7.2	4.6	2.1	1.0	0.0	0.0	0.0	0.0
239	I	33.3	15.9	7.2	4.6	2.6	1.0	0.0	0.0	0.0	0.0
240	I	34.4	16.4	7.7	5.6	3.1	1.0	0.0	0.0	0.0	0.0
241	I	34.4	15.9	8.2	5.6	2.6	0.5	0.0	0.0	0.0	0.0
242	I	33.8	16.4	8.2	4.6	2.1	0.5	0.0	0.0	0.0	0.0
243	I	34.9	16.9	7.2	4.1	2.1	0.5	0.0	0.0	0.0	0.0
244	I	34.4	14.9	6.7	4.1	2.1	0.5	0.0	0.0	0.0	0.0
245	I	31.3	12.8	6.7	4.1	2.1	0.5	0.0	0.0	0.0	0.0
246	I	30.8	12.8	6.7	4.1	2.1	0.5	0.0	0.0	0.0	0.0
247	I	30.3	11.8	6.7	4.1	2.1	0.5	0.0	0.0	0.0	0.0
248	I	29.2	11.8	6.7	4.1	2.1	0.5	0.0	0.0	0.0	0.0
249	I	29.2	12.3	7.2	4.1	2.1	0.5	0.0	0.0	0.0	0.0
250	I	29.7	13.3	7.7	4.1	2.1	0.5	0.0	0.0	0.0	0.0
251	I	30.8	14.4	7.7	4.1	2.1	0.5	0.0	0.0	0.0	0.0
252	I	32.3	13.8	7.2	3.6	2.1	0.5	0.0	0.0	0.0	0.0
253	I	31.3	12.8	6.7	3.1	1.5	0.0	0.0	0.0	0.0	0.0
254	I	29.7	12.8	6.2	2.6	1.0	0.0	0.0	0.0	0.0	0.0
255	I	28.7	12.3	5.6	1.5	0.5	0.0	0.0	0.0	0.0	0.0
256	I	27.2	11.8	4.6	1.0	0.5	0.0	0.0	0.0	0.0	0.0
257	I	25.1	10.3	4.1	1.0	0.5	0.0	0.0	0.0	0.0	0.0
258	I	23.6	10.3	4.1	1.0	0.5	0.0	0.0	0.0	0.0	0.0
259	I	24.1	10.3	4.1	1.0	0.5	0.0	0.0	0.0	0.0	0.0
260	I	24.1	10.8	4.1	1.0	0.5	0.0	0.0	0.0	0.0	0.0
261	I	23.1	10.8	4.1	1.0	0.5	0.0	0.0	0.0	0.0	0.0
262	I	23.1	11.3	4.6	1.5	0.5	0.0	0.0	0.0	0.0	0.0
263	I	23.1	11.8	5.1	1.5	0.5	0.0	0.0	0.0	0.0	0.0
264	I	24.1	12.3	5.6	1.5	0.5	0.0	0.0	0.0	0.0	0.0
265	I	24.1	12.8	5.6	2.1	0.5	0.0	0.0	0.0	0.0	0.0

TABLE C

LENGTH OF TSTM RUN IN CONSECUTIVE DAYS(K)

DAY	I	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	K <sub>5</sub>	K <sub>6</sub>	K <sub>7</sub>	K <sub>8</sub>	K <sub>9</sub>	K <sub>10</sub>
NUMBER	I	K <sub>1</sub>	K <sub>2</sub>	K <sub>3</sub>	K <sub>4</sub>	K <sub>5</sub>	K <sub>6</sub>	K <sub>7</sub>	K <sub>8</sub>	K <sub>9</sub>	K <sub>10</sub>
266	I	23.1	11.8	5.6	1.5	0.0	0.0	0.0	0.0	0.0	0.0
267	I	22.1	11.8	5.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0
268	I	21.0	10.6	4.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0
269	I	19.0	9.2	4.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0
270	I	17.4	9.2	3.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0
271	I	17.4	8.7	3.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0
272	I	17.4	8.2	3.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0
273	I	16.4	7.2	3.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0
274	I	14.9	7.7	3.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0
275	I	14.9	7.2	3.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0
276	I	14.4	7.2	3.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0
277	I	14.4	7.2	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0
278	I	13.8	6.2	2.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0
279	I	12.3	5.1	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0
280	I	11.8	4.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
281	I	10.8	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
282	I	9.2	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
283	I	8.7	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
284	I	9.2	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
285	I	9.2	2.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
286	I	8.7	2.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
287	I	8.2	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
288	I	8.7	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
289	I	8.2	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
290	I	7.7	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
291	I	7.7	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
292	I	7.2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
293	I	6.7	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
294	I	5.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
295	I	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
296	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
297	I	4.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
298	I	4.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
299	I	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
301	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
302	I	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
303	I	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
304	I	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
305	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
306	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
307	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
308	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
309	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
310	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
311	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
312	I	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
313	I	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
314	I	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
315	I	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
316	I	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
317	I	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
318	I	1.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE C

## LENGTH OF TSTM RUN IN CONSECUTIVE DAYS(K)

DAY	I	K=1	K=2	K=3	K=4	K=5	K=6	K=7	K=8	K=9	K=10
NUMBER	I	K=1	K=2	K=3	K=4	K=5	K=6	K=7	K=8	K=9	K=10
319	I	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
320	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
321	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
322	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
323	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
324	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
325	I	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
326	I	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
327	I	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
328	I	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
329	I	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
330	I	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
331	I	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
332	I	4.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
333	I	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
334	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
335	I	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
336	I	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
337	I	2.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
338	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
339	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
340	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
341	I	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
342	I	2.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
343	I	2.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
344	I	2.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
345	I	2.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
346	I	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
347	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
348	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
349	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
350	I	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
351	I	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
352	I	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
353	I	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
354	I	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
355	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
356	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
357	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
358	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
359	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
360	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
361	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
362	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
363	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
364	I	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
365	I	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

+PERCENT PROBABILITY OF AT LEAST ONE THUNDERSTORM  
 +OCCURRING ON AT LEAST ONE ADDITIONAL DAY BETWEEN 1000-  
 +2200EST HAVING ALREADY OCCURRED BETWEEN 1000-2200EST  
 +ON I PRECEEDING DAYS FOR MONTH OF MAY.

RUNS +

STRTG+

ON +

DATE	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9
1 +	38.0	12.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 +	30.5	13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3 +	36.3	12.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 +	33.3	21.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5 +	29.7	24.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 +	30.9	32.6	33.3	0.0	0.0	0.0	0.0	0.0	0.0
7 +	32.1	41.2	23.8	0.0	0.0	0.0	0.0	0.0	0.0
8 +	33.1	41.2	23.8	0.0	0.0	0.0	0.0	0.0	0.0
9 +	31.9	45.7	23.8	0.0	0.0	0.0	0.0	0.0	0.0
10 +	33.1	41.2	23.8	0.0	0.0	0.0	0.0	0.0	0.0
11 +	33.1	41.2	23.8	0.0	0.0	0.0	0.0	0.0	0.0
12 +	37.8	41.9	38.5	0.0	0.0	0.0	0.0	0.0	0.0
13 +	41.6	40.3	32.3	0.0	0.0	0.0	0.0	0.0	0.0
14 +	40.0	37.8	32.3	0.0	0.0	0.0	0.0	0.0	0.0
15 +	38.1	37.8	32.3	0.0	0.0	0.0	0.0	0.0	0.0
16 +	37.7	41.4	41.7	33.3	0.0	0.0	0.0	0.0	0.0
17 +	39.8	44.6	51.2	23.8	0.0	0.0	0.0	0.0	0.0
18 +	38.6	47.4	45.7	23.8	0.0	0.0	0.0	0.0	0.0
19 +	42.7	39.8	51.2	23.8	0.0	0.0	0.0	0.0	0.0
20 +	41.0	44.7	56.5	19.2	0.0	0.0	0.0	0.0	0.0
21 +	44.8	42.6	45.7	23.8	0.0	0.0	0.0	0.0	0.0
22 +	44.1	40.7	45.7	23.8	0.0	0.0	0.0	0.0	0.0
23 +	43.1	40.7	45.7	23.8	0.0	0.0	0.0	0.0	0.0
24 +	44.2	39.0	45.7	23.8	0.0	0.0	0.0	0.0	0.0
25 +	44.2	39.0	45.7	23.8	0.0	0.0	0.0	0.0	0.0
26 +	45.2	41.5	51.0	38.5	50.0	100.0	0.0	0.0	0.0
27 +	45.4	48.4	58.1	41.7	66.7	50.0	0.0	0.0	0.0
28 +	44.4	58.5	56.9	51.2	47.6	50.0	0.0	0.0	0.0
29 +	48.9	59.4	62.2	51.0	57.7	33.3	0.0	0.0	0.0
30 +	49.3	60.4	64.4	55.4	48.4	33.3	0.0	0.0	0.0
31 +	51.9	56.5	64.4	46.4	57.7	33.3	0.0	0.0	0.0

Data to right of this line  
computed from 10 or less cases.

Table D—Conditional probabilities

+PERCENT PROBABILITY OF AT LEAST ONE THUNDERSTORM  
 +OCCURRING ON AT LEAST ONE ADDITIONAL DAY BETWEEN 1000-  
 +2200EST HAVING ALREADY OCCURRED BETWEEN 1000-2200EST  
 +ON I PRECEEDING DAYS FOR MONTH OF JUN.

RUNS +	STRG+	ON +	DATE +	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9
1 +			52.4	56.1	55.4	51.0	57.7	33.3	0.0	0.0	0.0	0.0
2 +			54.9	51.5	58.6	51.0	57.7	33.3	0.0	0.0	0.0	0.0
3 +			53.2	56.1	55.4	51.0	57.7	33.3	0.0	0.0	0.0	0.0
4 +			55.8	54.4	55.4	60.8	67.7	47.6	50.0	0.0	0.0	0.0
5 +			54.7	55.7	57.7	64.3	72.2	57.7	33.3	0.0	0.0	0.0
6 +			56.5	55.7	63.9	66.1	75.6	48.4	33.3	0.0	0.0	0.0
7 +			58.2	55.7	65.0	68.7	67.4	48.4	33.3	0.0	0.0	0.0
8 +			60.1	56.5	68.1	59.7	67.4	48.4	33.3	0.0	0.0	0.0
9 +			61.0	61.0	64.1	62.2	60.8	48.4	33.3	0.0	0.0	0.0
10 +			65.3	59.7	66.7	55.4	51.0	38.5	50.0	0.0	0.0	0.0
11 +			64.0	58.5	59.4	56.1	45.7	47.6	50.0	0.0	0.0	0.0
12 +			64.4	55.2	61.7	50.0	51.2	47.6	50.0	0.0	0.0	0.0
13 +			64.4	55.2	57.9	46.8	41.7	66.7	50.0	0.0	0.0	0.0
14 +			63.6	53.1	56.3	43.1	48.4	66.7	50.0	0.0	0.0	0.0
15 +			61.3	56.4	54.1	50.0	58.3	71.4	66.7	50.0	100.0	
16 +			63.1	56.4	61.7	56.1	67.4	67.7	71.4	66.7	100.0	
17 +			59.0	61.0	63.9	60.9	64.3	72.2	80.8	71.4	100.0	
18 +			62.4	62.1	67.9	57.4	66.1	75.6	83.9	80.8	100.0	
19 +			63.8	64.0	64.9	54.9	66.1	75.6	83.9	100.0	100.0	
20 +			63.5	62.8	64.9	54.9	66.1	75.6	100.0	100.0	100.0	
21 +			63.2	61.7	64.9	54.9	66.1	87.8	100.0	100.0	86.1	
22 +			60.3	64.0	64.9	54.9	74.2	89.1	100.0	87.8	86.1	
23 +			59.4	64.5	63.9	62.0	76.1	90.2	89.1	87.8	86.1	
24 +			58.0	64.1	65.9	62.0	83.6	82.1	89.1	87.8	86.1	
25 +			58.0	66.0	60.9	69.9	86.1	74.2	89.1	87.8	86.1	
26 +			59.9	63.3	66.9	72.6	81.7	76.1	80.4	87.8	86.1	
27 +			57.8	65.2	67.8	73.7	82.8	70.8	80.4	87.8	86.1	
28 +			59.7	67.4	64.7	78.9	79.4	66.2	80.4	87.8	86.1	
29 +			62.9	64.4	68.2	77.4	74.8	66.2	80.4	87.8	86.1	
30 +			61.0	65.7	68.2	72.9	74.2	63.9	78.3	86.1	83.9	

Data to right of this line  
computed from 10 or less cases.

+PERCENT PROBABILITY OF AT LEAST ONE THUNDERSTORM  
 +OCCURRING ON AT LEAST ONE ADDITIONAL DAY BETWEEN 1000-  
 +2200EST HAVING ALREADY OCCURRED BETWEEN 1000-2200EST  
 +ON I PRECEEDING DAYS FOR MONTH OF JUL.

RUNS +

STRTG+

ON +

DATE	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9
1 +	61.2	65.1	64.7	70.7	71.3	66.1	75.6	83.9	80.8
2 +	65.6	61.1	63.8	69.5	68.3	64.3	72.2	80.8	71.4
3 +	62.5	61.3	65.9	69.5	68.3	64.3	72.2	80.8	71.4
4 +	62.1	60.6	64.9	72.6	68.3	64.3	72.2	80.8	47.6
5 +	63.6	60.6	67.8	73.7	71.3	66.1	75.6	48.4	33.3
6 +	61.8	63.5	68.7	74.8	72.8	68.7	56.5	38.5	50.0
7 +	65.5	65.1	70.0	77.4	74.8	59.7	56.5	38.5	50.0
8 +	67.2	67.7	72.7	79.2	69.5	62.2	60.8	32.3	50.0
9 +	70.2	68.7	76.3	75.0	70.7	64.4	55.4	32.3	50.0
10 +	69.4	70.6	74.2	75.0	70.7	64.4	55.4	32.3	50.0
11 +	70.2	68.7	74.0	74.2	69.5	62.2	60.8	32.3	50.0
12 +	69.5	69.3	73.3	73.4	68.1	66.2	60.8	32.3	50.0
13 +	68.0	69.1	76.4	72.5	66.7	70.8	60.8	32.3	50.0
14 +	67.2	71.7	76.4	72.5	71.3	72.7	55.4	32.3	50.0
15 +	70.1	72.2	77.0	73.4	72.6	68.3	55.4	32.3	50.0
16 +	70.9	73.2	78.1	72.0	69.5	68.3	55.4	32.3	50.0
17 +	70.0	77.0	76.5	66.9	72.6	68.3	55.4	32.3	50.0
18 +	72.1	75.7	71.9	71.1	72.6	68.3	55.4	32.3	50.0
19 +	72.1	71.9	75.7	71.1	72.6	68.3	55.4	32.3	100.0
20 +	68.8	74.5	73.3	70.1	71.3	66.2	51.0	57.7	100.0
21 +	73.0	73.6	74.0	71.1	72.6	62.2	70.6	58.3	100.0
22 +	70.4	73.6	74.0	71.1	68.1	72.7	64.3	72.2	100.0
23 +	72.0	74.6	74.8	66.9	72.6	68.3	73.2	87.8	100.0
24 +	72.4	74.6	72.2	67.8	69.5	75.6	82.3	90.2	100.0
25 +	73.2	71.3	74.3	65.9	73.7	82.8	86.1	90.3	91.1
26 +	69.8	73.9	72.8	68.7	78.9	84.5	87.8	86.1	82.3
27 +	70.9	72.8	75.2	71.9	81.2	85.2	83.7	80.5	82.3
28 +	70.6	74.4	76.2	70.8	85.5	82.2	79.4	80.5	82.3
29 +	70.9	76.5	74.9	72.0	81.9	78.0	83.7	80.5	82.3
30 +	72.0	75.4	74.9	72.0	78.5	81.4	83.7	80.5	82.3
31 +	70.7	75.8	73.5	69.0	81.9	81.4	83.7	80.5	82.3

Data to right of this line  
computed from 10 or less cases.

+PERCENT PROBABILITY OF AT LEAST ONE THUNDERSTORM  
 +OCCURRING ON AT LEAST ONE ADDITIONAL DAY BETWEEN 1000-  
 +2200EST HAVING ALREADY OCCURRED BETWEEN 1000-2200EST  
 +ON I PRECEEDING DAYS FOR MONTH OF AUG.

RUNS +

STRTG+

ON +

DATE	I=1	I=2	I=3	I=4	I=5	I=6	I=7	I=8	I=9
1 +	69.7	75.4	71.2	72.6	81.9	81.4	83.7	80.5	82.3
2 +	69.0	74.0	70.6	71.9	81.2	80.6	82.8	77.8	82.1
3 +	66.7	73.4	69.9	71.5	80.5	79.6	81.7	76.1	80.4
4 +	65.9	72.8	70.7	70.7	78.9	79.4	80.5	74.2	78.3
5 +	64.0	72.6	68.8	67.9	75.9	81.7	76.1	80.4	75.6
6 +	65.6	70.6	67.4	65.1	74.2	77.8	82.1	78.3	72.2
7 +	63.5	67.7	64.9	61.7	68.3	82.1	78.3	72.2	57.7
8 +	60.4	67.4	62.1	61.0	70.8	70.6	72.2	57.7	33.3
9 +	58.6	67.0	63.1	63.7	56.9	63.4	57.7	33.3	0.0
10 +	60.1	68.3	63.1	54.9	50.0	48.4	33.3	0.0	0.0
11 +	61.0	69.9	56.8	51.9	37.5	23.8	0.0	0.0	0.0
12 +	60.3	64.0	55.7	47.4	21.7	0.0	0.0	0.0	0.0
13 +	57.6	63.3	51.6	43.9	13.9	0.0	0.0	0.0	0.0
14 +	57.1	60.6	51.7	46.8	27.8	0.0	0.0	0.0	0.0
15 +	54.8	58.5	55.8	53.2	24.4	0.0	0.0	0.0	0.0
16 +	54.5	61.1	59.4	50.0	24.4	0.0	0.0	0.0	0.0
17 +	56.5	58.8	61.7	50.0	24.4	0.0	0.0	0.0	0.0
18 +	57.0	57.6	61.7	50.0	24.4	0.0	0.0	0.0	0.0
19 +	57.0	57.6	61.7	50.0	24.4	0.0	0.0	0.0	0.0
20 +	58.8	55.2	61.7	50.0	24.4	0.0	0.0	0.0	0.0
21 +	56.1	54.2	60.2	46.8	27.8	0.0	0.0	0.0	0.0
22 +	53.9	51.1	54.9	50.0	32.3	0.0	0.0	0.0	0.0
23 +	51.3	46.0	55.4	51.0	19.2	0.0	0.0	0.0	0.0
24 +	48.5	45.8	56.1	45.7	23.8	0.0	0.0	0.0	0.0
25 +	48.4	45.6	59.7	45.7	23.8	0.0	0.0	0.0	0.0
26 +	49.2	43.9	63.9	45.7	47.6	0.0	0.0	0.0	0.0
27 +	47.7	45.3	63.9	56.5	38.5	0.0	0.0	0.0	0.0
28 +	47.7	47.0	72.7	55.4	32.3	0.0	0.0	0.0	0.0
29 +	46.2	51.6	68.3	46.4	19.2	0.0	0.0	0.0	0.0
30 +	48.5	50.0	56.1	45.7	23.8	0.0	0.0	0.0	0.0
31 +	48.4	42.6	56.9	51.2	23.8	0.0	0.0	0.0	0.0

Data to right of this line computed  
from 10 or less cases.

TABLE E

THE NUMBER OF EACH DAY OF THE YEAR

DAY	I	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	I	DAY	
OF	I	1	32	60	91	121	152	182	213	244	274	305	335	I	1	
MONTH	I	1	2	33	61	92	122	153	183	214	245	275	306	336	I	2
1	I	1	34	62	93	123	154	184	215	246	276	307	337	I	3	
2	I	4	35	63	94	124	155	185	216	247	277	308	338	I	4	
3	I	5	36	64	95	125	156	186	217	248	278	309	339	I	5	
4	I	6	37	65	96	126	157	187	218	249	279	310	340	I	6	
5	I	7	38	66	97	127	158	188	219	250	280	311	341	I	7	
6	I	8	39	67	98	128	159	189	220	251	281	312	342	I	8	
7	I	9	40	68	99	129	160	190	221	252	282	313	343	I	9	
8	I	10	41	69	100	130	161	191	222	253	283	314	344	I	10	
9	I	11	42	70	101	131	162	192	223	254	284	315	345	I	11	
10	I	12	43	71	102	132	163	193	224	255	285	316	346	I	12	
11	I	13	44	72	103	133	164	194	225	256	286	317	347	I	13	
12	I	14	45	73	104	134	165	195	226	257	287	318	348	I	14	
13	I	15	46	74	105	135	166	196	227	258	288	319	349	I	15	
14	I	16	47	75	106	136	167	197	228	259	289	320	350	I	16	
15	I	17	48	76	107	137	168	198	229	260	290	321	351	I	17	
16	I	18	49	77	108	138	169	199	230	261	291	322	352	I	18	
17	I	19	50	78	109	139	170	200	231	262	292	323	353	I	19	
18	I	20	51	79	110	140	171	201	232	263	293	324	354	I	20	
19	I	21	52	80	111	141	172	202	233	264	294	325	355	I	21	
20	I	22	53	81	112	142	173	203	234	265	295	326	356	I	22	
21	I	23	54	82	113	143	174	204	235	266	296	327	357	I	23	
22	I	24	55	83	114	144	175	205	236	267	297	328	358	I	24	
23	I	25	56	84	115	145	176	206	237	268	298	329	359	I	25	
24	I	26	57	85	116	146	177	207	238	269	299	330	360	I	26	
25	I	27	58	86	117	147	178	208	239	270	300	331	361	I	27	
26	I	28	59	87	118	148	179	209	240	271	301	332	362	I	28	
27	I	29		88	119	149	180	210	241	272	302	333	363	I	29	
28	I	30		89	120	150	181	211	242	273	303	334	364	I	30	
29	I	31		90		151		212	243		304		365	I	31	
	I	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	I		

Table E---Conversion from date to day number

TABLE F

BEGINNING AND ENDING TIMES (EST) OF TSTMS FOR YEAR 1951

DATE	BEGIN	END	BEGIN	END	BEGIN	END
APR 2	1842	1930				
APR 12	0738	1130				
APR 18	2217	2330				
APR 19	1330	2430				
APR 20						
MAY 3	1830	2030				
MAY 11	1900	2130				
MAY 16	1950	2045	2120	2200		
MAY 21	1405	1615	1640	1730		
MAY 25	1500	1600	1750	1850		
MAY 27	1600	1820				
JUN 4	0240	0415				
JUN 5	1910	2140				
JUN 7	0001	0030				
JUN 10	1245	1400				
JUN 11	1150	1420	1500	1715	1730	1830
JUN 12	1315	1936				
JUN 15	1230	1415				
JUN 16	1305	1420				
JUN 17	1650	1900				
JUN 18	1345	1730				
JUN 20	1815	2030				
JUN 21	1550	1745				
JUN 24	1240	1305				
JUN 30	1320	1615				
JUL 1	1530	2010				
JUL 4	1240	1330				
JUL 6	1125	1445	2300	2700		
JUL 7	1230	1700				
JUL 18	1155	1530				
JUL 20	1350	1540	1930	2010		
JUL 21	1120	1515				
JUL 22	0920	1030	1110	1215	1250	1415
JUL 23	1235	1300	1430	1446		
JUL 24	1615	1730				
JUL 28	1210	1415				
JUL 29	1240	1600				
JUL 30	1410	1600				
JUL 31	1730	2020				
AUG 1	1800	2245				
AUG 2	1530	1700				
AUG 4	1740	1830				
AUG 7	1505	1730				
AUG 8	1505	1545	1620	1745	1800	1945
AUG 9	1245	1400	1630	1745		
AUG 16	1500	1720				
AUG 18	0040	0100				
AUG 19	1220	1400				
AUG 21	0230	0400				
AUG 25	1330	1430				
AUG 26	0700	1230				
SEP 2	1415	1620				
SEP 3	1530	1845				
SEP 4	1315	1500				

SEP	5	1446	1530				
SEP	6	1630	1750				
SEP	7	1440	1640				
SEP	15	1650	1746	1920	2000		
SEP	16	1828	2011	2044	2130	2138	2338
SEP	17	1450	1730				
SEP	18	0250	0420	1555	1815		
SEP	19	1415	1830				
SEP	28	0145	0201	1306	1330		
OCT	9	1630	1750				
OCT	21	0710	0800	1635	1730		
OCT	22	0610	0645	1330	1730		
OCT	24	1230	1345				
NOV	15	1805	2930				
NOV	16	0655	1230	1517	1731		
DEC	27	0258	0445				

BEGINNING AND ENDING TIMES (EST) OF TSTM FOR YEAR 1952

DATE	BEGIN	END	BEGIN	END	BEGIN	END
FEB 17	0133	0220				
MAR 14	1605	1649				
MAR 15	0415	0745				
MAR 26	0120	0230				
APR 2	1805	2042				
APR 13	1554	1745				
APR 25	1515	1712				
MAY 3	1600	1645				
MAY 10	1801	1942				
MAY 11	1159	1247	1727	1917	2113	2318
MAY 17	1536	1743				
MAY 19	2128	2304				
MAY 20	1808	2157				
MAY 21	1907	2254				
MAY 22	1440	1515	1550	2000		
MAY 26	1527	1804				
MAY 29	1355	1534				
MAY 31	2010	2255				
JUN 8	1731	1815				
JUN 9	1543	1614				
JUN 12	1345	1600				
JUN 13	0715	1215				
JUN 18	1517	1718	1929	2028		
JUN 19	1147	1407	1713	1823		
JUN 22	1315	1445				
JUN 24	1519	1654				
JUN 26	2258	2428				
JUN 27	0110	0345				
JUL 5	1327	1618	2302	2428		
JUL 6	0642	0730	1834	2325		
JUL 7	0420	0515	1215	1345	1631	1753
JUL 9	1440	1615				
JUL 10	1306	1452	1619	2015		
JUL 13	0546	0630	0827	0928	1503	1650
JUL 17	0534	0554				

JUL 27	0846	1031
JUL 28	1037	1320
JUL 29	1407	1705
JUL 31	1214	1416
AUG 1	1727	2338
AUG 2	1010	1207
		1607 2026
AUG 3	1059	1246
AUG 5	0627	0705
		1745 1900
AUG 8	1806	1955
AUG 10	1436	1644
AUG 14	1542	1604
AUG 15	1158	1355
AUG 16	1428	1702
AUG 17	1453	1654
AUG 19	1500	1600
AUG 22	2312	2650
AUG 23		
AUG 24	1236	1316
AUG 25	1410	1445
AUG 30	1304	1732
SEP 6	2222	2330
SEP 7	1056	1136
SEP 10	1653	1743
SEP 12	0429	0528
SEP 18	1503	1538
		1642 1831
SEP 19	1500	1731
		1744 1900
SEP 21	0221	0342
		1151 1444
SEP 22	1640	1830
SEP 23	1614	1644
		2246 2312
SEP 27	1406	1431
SEP 28	2100	2132
		2236 2414
OCT 6	2225	2322
OCT 14	1655	2352
DEC 10	1900	1958

#### BEGINNING AND ENDING TIMES (EST) OF TSTM'S FOR YEAR 1957

DATE	BEGIN	END	BEGIN	END	BEGIN	END
MAR 4	1342	1420				
MAR 15	1520	1622				
MAR 21	1945	2001	2100	2210	2255	2519
MAR 22	0224	0339	0558	0654		
APR 1	1650	1910				
MAY 1	1758	1840				
MAY 2	1558	1754	2006	2035		
MAY 11	1723	1854	2254	2424		
MAY 12	1442	1938	2008	2128		
MAY 13	1625	1746				
MAY 17	1424	2003				
MAY 19	1730	2005				
MAY 20	1610	2305				
MAY 27	1805	1848				
MAY 28	1302	1348				
MAY 29	2022	2250				
MAY 30	0956	1510				

JUN	3	1319	1359						
JUN	4	1740	1935						
JUN	5	1659	1740	1755	1810				
JUN	6	1658	1745	1902	2159				
JUN	8	1558	1741	1816	2104				
JUN	9	1012	1041						
JUN	10	1528	1612	2158	2228				
JUN	21	1408	1554						
JUN	25	1435	1857						
JUN	26	1426	1758						
JUN	27	1605	1657						
JUN	30	1240	1332						
JUL	2	1448	1728						
JUL	3	1059	1424	1640	1735				
JUL	4	1313	1614						
JUL	10	1459	1558						
JUL	11	1240	1643						
JUL	12	0440	0536	1159	1408				
JUL	13	1212	1323						
JUL	15	1328	1344	1358	1440	1559	1658		
JUL	17	1340	1430	1448	1742	1817	2120		
JUL	18	1036	1858						
JUL	19	1337	1735						
JUL	24	1543	1758	1958	2215				
JUL	25	1024	1242	1532	1710				
JUL	28	1435	1613						
JUL	29	1350	1744						
JUL	30	1450	1724						
JUL	31	1504	1545						
AUG	1	1345	1428	1451	1629				
AUG	2	1454	1647						
AUG	3	1157	1235	1250	1714				
AUG	4	1330	1440						
AUG	7	2354	2615						
AUG	8								
AUG	10	1358	1650	1940	1958				
AUG	16	1823	1840						
AUG	18	1618	1810						
AUG	19	1716	1813						
AUG	20	1335	1510						
AUG	21	1025	1113						
AUG	22	1335	1650						
AUG	23	0210	0530	0559	0728				
AUG	24	0115	0310	0559	0620	1544	1714		
AUG	25	1544	1659						
AUG	28	1742	1828	1858	1928	2021	2037	2258	2514
AUG	29	1059	1220						
SEP	4	1108	1147	1315	1557	1840	2025		
SEP	5	0910	0959	1558	1938				
SEP	6	1225	1414	1545	1652				
SEP	7	1158	1244	1359	1710				
SEP	8	1357	1537						
SEP	9	0750	0806						
SEP	16	1521	1620	1835	1915				
SEP	24	2035	2144						
SEP	25	0935	1014	1059	1212				
SEP	29	2033	2258						
SEP	30	1731	1940						

OCT	1	1438	1613	1826	1959
OCT	2	1410	1430		
OCT	18	1645	1820		
NOV	30	1257	1313		
DEC	23	2157	2245	2312	2335
DEC	24			2359	2520
DEC	26	1232	1248		

BEGINNING AND ENDING TIMES (EST) OF TSTM'S FOR YEAR 1958

DATE	BEGIN	END	BEGIN	END	BEGIN	END
JAN 13	1918	1934	1954	2055		
FEB 8	0630	0728				
MAR 3	1155	1427				
MAR 12	1713	1922				
MAR 13	2159	2259	2329	2356		
MAR 24	1213	1327	1409	1425		
APR 9	1507	1640				
APR 10	1031	1107				
APR 22	1210	1314				
MAY 5	1458	1859				
MAY 6	0443	0459	1358	1520	1730	1758
MAY 11	1118	1327	1357	1425		
MAY 12	2212	2255				
MAY 13	1015	1125				
MAY 25	1748	2051				
JUN 19	2026	2115				
JUN 20	1914	2158				
JUN 21	1452	1636				
JUN 22	1140	1210				
JUN 24	1530	1858				
JUN 26	1740	1957				
JUN 27	1538	1735				
JUN 28	1127	1655				
JUN 29	1137	1159	1623	1859		
JUN 30	0527	0640				
JUL 1	0610	0705	1057	1215		
JUL 3	2025	2055				
JUL 14	0115	0229				
JUL 20	1719	1832				
JUL 24	1259	1418	1804	2059		
JUL 25	1412	1659				
JUL 26	1656	1859				
JUL 27	1539	1921				
JUL 29	1530	1758				
AUG 2	1240	1430				
AUG 4	1221	1347				
AUG 5	1129	1407				
AUG 6	1631	1744				
AUG 7	0231	0440	0705	0731		
AUG 14	0040	0120	1959	2058		
AUG 15	1217	1327				
AUG 17	2058	2315				
AUG 18	1457	1612				
AUG 19	1155	1414	1545	1635		

AUG 23	1127	1157			
AUG 25	0010	0145	1637	1704	
AUG 26	1530	1559	1657	1747	1812 1925
AUG 31	1557	1858			
SEP 3	1303	1419			
SEP 7	1858	2007	2333	2525	
SEP 8	1559	1923	2359	2547	
SEP 9					
SEP 13	0058	0135			
SEP 14	1515	1759			
SEP 22	1559	1917			
SEP 23	1020	1159			
SEP 28	1230	1312			
OCT 1	1830	1939			
NOV 6	1642	1715			

BEGINNING AND ENDING TIMES (EST) OF TSTMS FOR YEAR 1959

DATE	BEGIN	END	BEGIN	END	BEGIN	END
JAN 16	0810	0910				
FEB 8	2107	2213				
FEB 24	1925	1958	2013	2059		
MAR 12	0836	0927				
MAR 30	1526	1629	1705	1743		
APR 1	1546	1820				
APR 2	1005	1058				
APR 12	1658	1829				
APR 20	2117	2328				
APR 21	1455	1525	2125	2359		
APR 30	1503	1622	1859	1938		
MAY 11	2233	2559				
MAY 12						
MAY 13	1621	2029				
MAY 14	1358	1514				
MAY 15	1730	1928				
MAY 16	1410	1459				
MAY 18	1145	1743				
MAY 20	1604	1743				
MAY 21	0945	1023				
MAY 31	1335	1358	1547	1845		
JUN 1	1620	1832				
JUN 3	1527	1850				
JUN 4	1330	1459	1716	1958		
JUN 5	1259	1355	1455	1525		
JUN 6	1727	2044	2114	2225		
JUN 15	1320	1420	1830	1939		
JUN 16	1355	1512				
JUN 22	1257	1326	1655	1727		
JUN 24	1359	1435				
JUN 30	1243	1325				
JUL 2	1409	1658	2011	2150		
JUL 3	1240	1420	1605	1655		
JUL 4	1318	1451	1628	1925		
JUL 9	1408	1710				
JUL 10	1130	1430				

JUL	11	1430	1620	1911	1932
JUL	12	1107	1345	1543	1718
JUL	13	1243	1616		
JUL	30	1257	1321	1758	1825
JUL	31	1202	1527		
AUG	1	1522	1555		
AUG	2	1230	1359	1416	1459
AUG	7	1107	1136	1340	1458
AUG	8	1257	1632		
AUG	9	1114	1559		
AUG	10	1108	1325		
AUG	12	1131	1159		
AUG	15	1940	1956	1959	2050
AUG	18	1138	1221		
AUG	22	2052	2145		
AUG	28	2243	2349		
AUG	31	1623	1639		
SEP	1	1322	1510		
SEP	2	1310	1614		
SEP	3	1245	1439		
SEP	4	1233	1419		
SEP	5	0505	0545		
SEP	6	0915	1125		
SEP	9	0855	0925	0955	1025
SEP	10	0659	0817		
SEP	13	1540	1735		
SEP	14	1340	1843		
SEP	15	1715	1917	1940	2030
SEP	20	0143	0227	0509	0613
OCT	4	0158	0353		
UCT	6	0934	1230		
OCT	11	1245	1328		
OCT	12	1903	1940	2016	2057
OCT	13	0318	0557		
UCT	17	0323	0339		
OCT	22	1058	1330	1633	1727

#### BEGINNING AND ENDING TIMES (EST) OF TSTM'S FOR YEAR 1960

DATE	BEGIN	END	BEGIN	END	BEGIN	END
FEB 4	1042	1158				
FEB 23	1520	1658				
MAR 15	1135	1559	1820	2059		
MAR 16	0958	1314	1350	2059	2159	2644
MAR 17	0444	0625	0859	1229	1744	2124
MAR 30	1857	1941				
APR 1	1420	1636				
APR 2	1859	2259				
APR 4	2330	2459				
APR 5						
MAY 1	1735	1913				
MAY 11	1358	1420				
MAY 23	1625	1656				
MAY 24	1510	1610				
MAY 25	1635	1713				

MAY 26	1808	1858	2033	2122
MAY 27	1440	1830		
JUN 2	1159	1511	1915	1943
JUN 3	1646	1858	1958	2123
JUN 4	1306	1538		
JUN 5	1134	1420	1945	2350
JUN 6	1230	1351	2328	2344
JUN 7	1310	1652	1657	1724
JUN 8	1230	1358		
JUN 16	1320	1712		
JUN 17	1358	1744	1917	2041
JUN 18	1325	1640		
JUN 19	1325	1422	1921	1945
JUN 20	1321	1505	1933	1954
JUN 22	1430	1606	1615	1752
JUN 23	1859	1935		
JUN 24	1752	1813		
JUN 27	1245	1356		
JUN 29	1106	1320		
JUL 2	1759	1915		
JUL 3	1557	1715	2345	2444
JUL 4	1359	1615		
JUL 5	1459	1844		
JUL 6	1330	1454		
JUL 7	1342	1459		
JUL 10	1257	1858		
JUL 11	1201	1512	1527	1904
JUL 12	1030	1317		
JUL 13	1359	1758	2035	2110
JUL 14	1705	1840		
JUL 15	1459	1555	1713	1958
JUL 16	1758	2413		
JUL 17	1630	2013		
JUL 18	1536	1649		
JUL 19	1758	1930		
JUL 23	1845	2042		
JUL 24	0158	0343	1416	1843
JUL 25	1330	1359	1715	2145
JUL 26	1749	1838		
JUL 31	1259	1527		
AUG 5	0530	0635		
AUG 8	1409	1534		
AUG 21	1255	1513	1658	1858
AUG 22	1358	2059		
AUG 23	1530	1714		
AUG 24	1047	1329	1643	1835
AUG 25	1420	1708		
AUG 26	1718	1938		
AUG 28	0557	0625		
AUG 29	0550	0615	1436	1617
			2110	2159
AUG 31	1934	2020		
SEP 1	0559	0720		
SEP 3	1220	1250		
SEP 5	0135	0210	1102	1145
SEP 7	0445	0921		
SEP 10	0915	0958		
SEP 12	1516	1558		
SEP 17	1429	1519	1541	1634
			1658	2013
			2115	2225

SEP 24	1558	1850				
SEP 25	0829	0929				
SEP 28	1710	2013				
SEP 29	1517	1712	1945	2220		
SEP 30	1214	1715				
OCT 7	1359	1555	1633	1828	1932	2028
OCT 8	1749	2013				
OCT 9	1218	1257				
OCT 13	1659	1914				
OCT 14	0259	0429				
OCT 31	1440	1459	1508	1540		

**BEGINNING AND ENDING TIMES (EST) OF TSTMS FOR YEAR 1961**

DATE	BEGIN	END	BEGIN	END	BEGIN	END		
JAN 13	0445	0501						
MAR 13	1846	1915						
MAR 18	1823	2043						
MAR 19	1830	2213						
MAR 31	2059	2459						
APR 1								
APR 12	1658	1725						
APR 16	0930	1040	1204	1259				
MAY 2	0159	0325						
MAY 9	1752	1832						
MAY 20	1758	1830						
MAY 21	1359	1650	1659	1815				
MAY 23	1830	1859						
MAY 25	1325	1447	1456	1740				
MAY 26	1356	1538						
JUN 7	1018	1137						
JUN 8	0545	0622	0645	0830	1042	1116		
JUN 11	1358	1645						
JUN 14	1435	1608						
JUN 15	1515	1830	1920	2125				
JUN 21	1455	1758						
JUN 23	1158	1613	1645	1830	1906	1958		
JUN 24	1256	1515						
JUN 25	1046	1457						
JUN 26	0258	0331	1036	1257	1345	1458		
JUN 27	1155	1840						
JUN 28	1518	1658	1845	2147				
JUN 30	1348	1440	1558	1643				
JUL 3	1150	2020						
JUL 4	1357	1741						
JUL 7	1332	1420	1428	1452	1825	2046	2057	2142
JUL 9	1446	1725						
JUL 10	1213	1232	1532	2322				
JUL 18	1057	1415	1533	2158				
JUL 19	0810	0858	1249	1622				
JUL 27	1558	1818						
JUL 31	2320	2630						
AUG 1								
AUG 2	1628	1830						
AUG 5	1725	2157						

AUG	9	0902	1038				
AUG	14	1028	1256				
AUG	15	1016	1406				
AUG	16	1017	1130				
AUG	17	0550	0730	1728	1829	1858	2415
AUG	18	1506	2238				
AUG	21	1605	2230				
AUG	22	1139	1444				
AUG	25	1155	1322				
AUG	27	1508	1530				
AUG	28	1115	1157	1948	2536		
AUG	29						
SEP	4	1357	1444				
SEP	5	0607	0741				
SEP	14	1656	2210				
SEP	15	1258	1457				
SEP	16	1758	2335				
SEP	17	0010	0157	0722	1008		
SEP	28	1930	1950				
SEP	29	1330	1351				
SEP	30	1123	1247				
OCT	13	1438	1557				
OCT	14	1550	1910				
NOV	23	1532	1558				
DEC	19	0845	1012				

BEGINNING AND ENDING TIMES (EST) OF TSTMS FOR YEAR 1962

DATE	BEGIN	END	BEGIN	END	BEGIN	END
FEB 5	1247	1319				
FEB 8	1512	1730	2010	2558		
FEB 9						
MAR 12	1740	1815				
MAR 13	2315	2358				
MAR 15	2233	2256				
MAR 16	0117	0158	0446	0546		
MAR 25	1620	1720				
APR 7	1358	1450				
APR 10	1640	1830				
APR 26	1344	1726				
APR 29	0535	0558				
MAY 5	0548	0644				
MAY 11	2026	2310				
MAY 20	1958	2220				
MAY 21	1410	1558				
JUN 1	0153	0258				
JUN 2	1358	1417	1458	1515		
JUN 5	1310	1815				
JUN 7	1130	1428				
JUN 8	1735	1910				
JUN 12	1228	1338				
JUN 13	1126	1320	1357	1458		
JUN 14	1521	1758				
JUN 20	1521	1610	1828	2020	2107	2156
JUN 21	1102	1355	1856	2020		

JUN	22	1217	1420	1455	1636	1655	1716
JUN	23	1415	1625				
JUN	25	1340	1430	1445	1535	2333	2425
JUN	26	1302	1458				
JUN	27	0212	0335				
JUN	28	0221	0421	1129	1530		
JUN	29	1033	1415				
JUL	5	1602	1722				
JUL	6	1451	1557	1816	1920		
JUL	7	1305	1358	1630	1732	1858	2035
JUL	8	1435	2215				
JUL	9	1315	1637				
JUL	10	1439	1815				
JUL	13	1505	1720				
JUL	15	1533	1815				
JUL	16	1232	1415				
JUL	17	1355	1444	1540	1858		
JUL	18	1128	1345	1358	1635		
JUL	19	1433	1640	1808	2250		
JUL	20	1250	1425	1458	1540		
JUL	21	1607	1710	1740	1838		
JUL	22	1623	1758				
JUL	26	1550	1638	1730	1935		
JUL	27	1433	1920	2045	2315		
JUL	30	1430	1933				
JUL	31	1645	1922				
AUG	1	1427	1655				
AUG	2	1420	1922				
AUG	3	1430	1741				
AUG	4	1550	2058				
AUG	5	1358	1958				
AUG	6	1126	1525				
AUG	7	1444	1810				
AUG	8	1240	1330				
AUG	9	1258	1445				
AUG	10	1615	1840				
AUG	14	2235	2420				
AUG	15	1443	1459				
AUG	16	1503	1836				
AUG	17	1245	1545	1620	1925		
AUG	18	1210	1558				
AUG	19	1058	1330				
AUG	20	1029	1058	1342	1555		
AUG	22	1215	1322	1355	1522		
AUG	23	1217	1258				
AUG	24	1350	1636				
AUG	25	1030	1138	1224	1543		
AUG	27	1550	1732				
AUG	28	1352	1738				
SEP	4	0845	0926	0957	1022		
SEP	6	1445	1645	1929	2145		
SEP	7	1543	1858				
SEP	13	1843	2025				
SEP	14	0846	0915	1410	1430		
SEP	17	1814	2315				
SEP	18	1540	1942	2257	2526		
SEP	19	1241	1818				
SEP	22	1844	1933				

SEP 23	1258	1525
OCT 4	1144	1245
OCT 5	2150	2335
OCT 31	0446	0504
NOV 21	1757	1857

**BEGINNING AND ENDING TIMES (EST) OF TSTMS FOR YEAR 1963**

DATE	BEGIN	END	BEGIN	END	BEGIN	END
JAN 21	0358	0508				
FEB 12	0010	0140	0205	0638		
FEB 19	0909	0935				
MAR 9	1731	1844				
MAR 27	1830	1945				
APR 7	0337	0421	0658	0745	0821	0840
APR 13	0705	0820				
MAY 1	0958	1052				
MAY 12	0257	0420				
MAY 21	2233	2320				
MAY 23	1125	1230	1620	2033	2240	2429
MAY 24						
MAY 25	1347	1620				
MAY 28	1030	1122	2338	2437		
MAY 29	0057	0121	1933	2122		
JUN 7	1725	1845				
JUN 9	1604	1658				
JUN 10	1116	1440	1926	2020		
JUN 12	1416	1544				
JUN 15	1535	1658				
JUN 16	1450	1721				
JUN 18	1843	1945				
JUN 23	0750	0835				
JUN 25	1058	1230				
JUN 26	1135	1320				
JUN 27	1358	1515	1540	1756		
JUN 28	1330	1820				
JUL 3	0020	0042	1446	1542	1615	1928
JUL 4	1625	1825	2010	2115		
JUL 5	1610	2110				
JUL 6	1343	1625				
JUL 7	1425	1825				
JUL 8	1220	1434	1450	1732		
JUL 9	1020	1525				
JUL 10	2342	2413				
JUL 11	1415	1520	1540	1625	1809	2221
JUL 12	1430	1649				
JUL 17	1115	1220				
JUL 21	1323	1627				
JUL 22	1140	1235	1318	1503		
JUL 24	1401	1446	1506	1812		
JUL 25	0647	0714				
AUG 1	1445	1618				
AUG 2	1504	1610				
AUG 8	2304	2540				
AUG 9	1258	1425	1929	2106		

AUG 10	1730	1840					
AUG 11	1022	1358	1543	1635			
AUG 13	1510	1715					
AUG 14	1210	1315					
AUG 15	1420	1529	1625	1745			
AUG 16	1530	1758					
AUG 17	1151	1626	2348	2420			
AUG 18							
AUG 19	2240	2410					
AUG 20	0652	0938					
AUG 21	1055	1258	1312	1355	1555	1710	
SEP 5	1430	1930					
SEP 11	1918	1952					
SEP 12	0530	0625					
SEP 18	1736	1844					
SEP 23	1410	1432					
OCT 14	1014	1055	1121	1217			
OCT 15	0616	0710	1140	1318	1750	2027	
OCT 19	1652	1739					
NOV 10	0032	0140	0430	0722			

BEGINNING AND ENDING TIMES (EST) OF TSTM'S FOR YEAR 1964

DATE	BEGIN	END	BEGIN	END	BEGIN	END
FEB 8	0120	0138				
MAR 28	0458	0809				
APR 24	2112	2145				
APR 25	1810	1935				
APR 27	1938	2120				
APR 28	1232	1331	1347	1545		
APR 30	1904	2030				
MAY 1	1017	1308				
MAY 13	1650	2035				
JUN 1	1856	2110				
JUN 3	1315	1412				
JUN 6	1507	1650				
JUN 24	0942	1016				
JUN 27	1410	1642				
JUN 29	1355	2030				
JUN 30	0150	0236				
JUL 1	1505	1916				
JUL 4	1525	2320				
JUL 5	1114	1458	1809	1916		
JUL 11	1317	1435				
JUL 22	1338	1925				
JUL 23	1242	1715				
JUL 24	1510	1635				
JUL 25	1352	1635				
AUG 4	2007	2242				
AUG 5	1548	1713	1944	2125		
AUG 6	1458	1649				
AUG 7	1323	1416				
AUG 10	1046	1112	1345	1438	1458	1544
AUG 11	1036	1717				
AUG 13	1620	1847				

AUG	14	1225	1630				
AUG	16	1824	2116				
AUG	17	1545	1812	2035	2155		
AUG	18	1158	1320	1435	1743	1932	2030
AUG	19	1215	1515				
AUG	20	1435	1834				
AUG	22	1817	2138				
AUG	23	1539	1833				
AUG	29	1731	1814	1921	2122	2230	2435
AUG	30	1209	1401				
SEP	1	1250	1425	1833	1936		
SEP	2	1930	2058				
SEP	3	1015	1149				
SEP	4	0941	1033				
SEP	10	1055	1123				
SEP	15	1237	1318				
OCT	26	0314	0343				
NOV	23	2058	2123	2212	2357		
NOV	24	0135	0212	0319	0425		
NOV	28	1644	2340				
DEC	4	1258	1540	1606	1719	1916	1944
DEC	5	1102	1512				

BEGINNING AND ENDING TIMES (EST) OF TSTM'S FOR YEAR 1965

DATE	BEGIN	END	BEGIN	END	BEGIN	END
JAN 15	0915	1012	1032	1107		
FEB 6	1445	1640				
MAR 13	1244	1327	1346	1543	1550	1723
MAR 20	1030	1258				
MAR 28	1245	1825				
MAR 30	0007	0120	1817	1941		
MAR 31	1630	1756				
APR 22	0541	0558				
APR 27	1722	1917				
APR 28	1313	1405	1605	1633		
MAY 12	1408	1455	1519	1721		
MAY 13	0328	0440				
MAY 29	1515	1743				
JUN 4	1350	1632				
JUN 8	0340	0413				
JUN 11	1522	1841				
JUN 12	1258	1531				
JUN 13	1516	1720	1757	1952		
JUN 14	1510	1823				
JUN 15	1126	1355	1455	2047		
JUN 16	1416	2022				
JUN 17	1317	1429	1512	1828		
JUN 18	1109	1250	1314	1645		
JUN 24	1507	1544	1747	1832		
JUN 25	1346	1822				
JUN 26	0020	0127				
JUL 1	1715	1825				
JUL 2	1610	1730				
JUL 3	1523	1741				

JUL	5	1608	2030
JUL	6	1739	2147
JUL	7	1555	1928
JUL	9	0422	0456
		1214	1312
JUL	10	1140	1358
JUL	14	1502	1850
JUL	15	1505	1758
JUL	16	1258	1341
JUL	17	0958	1314
JUL	18	1320	1635
JUL	19	1258	1314
JUL	20	1358	1534
JUL	21	1340	1440
		1455	1530
JUL	22	0457	0535
JUL	24	0058	0231
JUL	28	0719	0851
JUL	30	1150	1245
JUL	31	1150	1206
AUG	1	1504	1825
AUG	2	1351	1427
AUG	3	1245	1430
		1510	1734
		1827	1930
AUG	7	1130	1743
AUG	9	1115	1214
		1517	1834
AUG	10	1416	1520
AUG	11	1844	1949
AUG	15	1502	1651
AUG	18	1403	1445
AUG	19	1156	1446
AUG	20	1312	1510
AUG	21	0418	0451
AUG	28	1427	1746
SEP	2	1406	1542
SEP	16	0349	0416
		1228	1426
SEP	17	0505	0531
SEP	30	2133	2152
OCT	6	1732	1945
OCT	14	0126	0218
NOV	22	1756	1832

#### BEGINNING AND ENDING TIMES (EST) OF TSTMS FOR YEAR 1966

DATE	BEGIN	END	BEGIN	END	BEGIN	END
FEB 28	2032	2125				
MAR 5	0357	0543	0620	0738		
APR 4	1046	1115				
MAY 7	1235	1733				
MAY 8	1340	2325				
MAY 9	0235	0511	1255	1340		
MAY 14	1640	1742				
MAY 17	1807	2035				
MAY 18	1811	2048				
MAY 22	1507	1750				
MAY 23	1109	1638	2156	2338		
MAY 24	1558	1715	1940	2130		
MAY 26	1204	1328				

MAY 27	1504	1743	1758	2013
MAY 29	1823	2115		
MAY 30	1529	1714	1758	1835
MAY 31	1404	1625		
JUN  5	0757	0905		
JUN  9	0115	0213		
JUN 14	1445	1603	1847	1943
JUN 15	1343	1448		
JUN 17	1630	1741	1835	1955
JUN 18	1635	1823		
JUN 19	1450	1738		
JUN 20	1415	1930	2305	2323
JUN 21	1216	1337		
JUL  1	0210	0226		
JUL  5	1937	2057		
JUL  6	1706	1747		
JUL 10	0650	0857		
JUL 21	1040	1414		
JUL 25	1258	1350		
JUL 26	0335	0536	1323	1415
			1508	1845
JUL 27	1535	1640		
JUL 28	1439	1531		
JUL 29	1650	1837		
JUL 30	1628	1740		
JUL 31	1656	2350		
AUG  1	1925	2058		
AUG  2	1340	1615		
AUG  3	1447	1830	1858	1940
AUG  4	1558	1838		
AUG  5	1125	1237	1257	1425
			2135	2235
AUG  6	1407	1915		
AUG  7	1520	1933		
AUG  8	1450	1852		
AUG  9	1330	1448		
AUG 22	0558	0955	1442	1525
			2045	2140
AUG 25	1540	1623	1635	1825
AUG 26	1618	1655		
SEP  3	1406	1437		
SEP  6	1418	1633	1750	2019
			2058	2220
SEP  7	1412	1820		
SEP  8	1055	1115		
SEP  9	0955	1011		
SEP 10	0040	0117	0206	0327
			1455	1520
SEP 12	1450	2140		
SEP 13	1625	1942		
SEP 15	0930	1050		
SEP 16	1628	1727	1735	1807
SEP 19	1948	2520		
SEP 20	0158	0243	1444	1730
			1758	1822
SEP 21	1321	1516	1556	1642
			1813	1930
SEP 26	2158	2216		
SEP 27	1433	1613	1758	2120
SEP 28	1405	1510	1645	1835
SEP 29	0930	1033		
OCT  1	1130	1158	1510	1641

BEGINNING AND ENDING TIMES (EST) OF TSTMS FOR YEAR 1967

DATE	BEGIN	END	BEGIN	END	BEGIN	END
FEB 12	2116	2217				
MAY 9	0856	1227				
MAY 22	1422	1442	1643	1746		
JUN 1	1938	2005	2133	2150		
JUN 2	1038	1418				
JUN 5	1302	1523	1653	1808		
JUN 6	1452	1622				
JUN 7	1355	1512				
JUN 8	1124	1142	1151	1320		
JUN 9	1029	1121	1405	1437	2255	2351
JUN 10	1255	1414	1618	1736		
JUN 16	2328	2403				
JUN 17	1433	1631				
JUN 18	1244	1525				
JUN 19	1335	1354	1550	1723		
JUN 20	1743	1830				
JUN 22	1125	1326	1816	2052		
JUN 23	1206	1420	1704	1815	1841	1930
JUN 24	1728	1843				
JUN 25	1455	1606	2010	2212		
JUN 26	1637	1753				
JUN 27	1818	2343				
JUN 28	1637	1932				
JUN 29	1627	1936				
JUN 30	1440	1722				
JUL 1	1447	1939				
JUL 2	1318	1906				
JUL 3	1303	1540				
JUL 4	1445	1856	2022	2056		
JUL 5	1253	1515				
JUL 6	0902	0933	1033	1428	1528	1732
JUL 12	1637	1726				
JUL 13	2005	2138	2217	2330	2348	2510
JUL 14	1409	1754	2151	2315		
JUL 15	1605	2004				
JUL 16	1609	1954				
JUL 17	1531	1720	2235	2256		
JUL 18	1520	1750				
JUL 19	1433	1947				
JUL 21	1835	1927				
JUL 22	1205	1645				
JUL 23	1730	1831				
JUL 24	1636	1844				
JUL 25	0624	0730	1604	2116		
JUL 26	1312	1617	2106	2147		
JUL 27	1307	1732				
JUL 29	1448	1854				
JUL 31	1340	1616				
AUG 1	1209	1256	1333	1626		
AUG 3	0333	0420	1018	1055	1119	1228
AUG 4	0523	0543				
AUG 5	1406	1806				
AUG 6	1149	1833				
AUG 7	1452	1612				

AUG	8	1505	1607
<u>AUG</u>	<u>11</u>	<u>1704</u>	<u>1808</u>
AUG	14	1318	1535
<u>AUG</u>	<u>30</u>	<u>1705</u>	<u>1840</u>
SEP	1	0245	0318
SEP	2	1940	2528
<u>SEP</u>	<u>3</u>	<u>1842</u>	<u>2046</u>
SEP	6	1654	1736
SEP	11	2252	2423
<u>SEP</u>	<u>12</u>	<u>0712</u>	<u>0732</u>
SEP	13	0713	1155
OCT	13	1548	1635
			1748 2012
DEC	11	1627	1653
			1932 2010
DEC	13	1546	1614